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NETWORK EDITION

Remote-Control Software

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Packages to Keep You
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PC LABS TESTS 58

Notebooks

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Inside

Something about trying to engineer an entire desktop's worth of the latest computing technology into a package no bigger than—well, no bigger than a notebook—makes laptop computers one of the most fascinating segments of the PC industry. Is there

any PC user who isn't intrigued by the latest advances in smaller, lighter, and faster machines?

At *PC Magazine*, we always look forward to our next megareview of laptop challengers, particularly when we have new tools to use in our testing procedures.

ttery types and the broad range of power management features found in these machines, battery-life tests have always cried out for a fair and reproducible benchmark test.

Above all, a good battery-life test must put the machines through the same paces that real users would—pausing between tasks, constantly readjusting the power management utilities, and struggling through the typical laptop's annoying habit of falling asleep at the wrong time.

Using the new BatteryMark test—developed by *PC Magazine* and the Ziff-Davis Benchmark Operation (ZDBOP)—and its accompanying hardware, the new ZDigit II, we can accurately determine a



The *PC Magazine* Labs staff couldn't wait to get their hands on the latest notebook computers.

In addition to our industry-standard Winstone 96 and Winstone 32 benchmark test suites, for this issue's review of 58 Pentium-class notebooks from 34 vendors, we used a newly launched Ziff-Davis benchmark test, BatteryMark, Version 1.0.

Besides size, power, and features, no aspect of a laptop is more important and more heatedly debated than battery life. Given the wide variety of bat-

portable battery's working life between charges.

Of course, battery life is just one of the many features we measure in our laptop Labs tests. And BatteryMark is just the latest in a series of tests we've developed to help determine the bragging rights among competing laptop manufacturers and, more important, to help you pick the portable PC that's right for you.—*Jake Kirchner*

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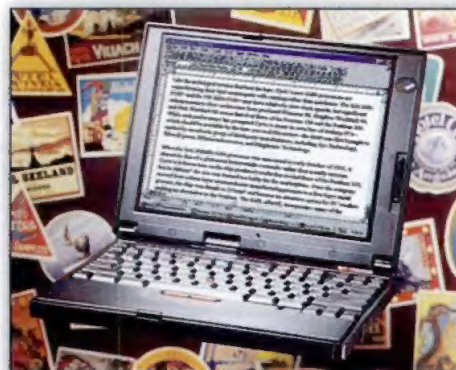
Bill Howard

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COVER STORY

Pentium Notebooks

Portable Property



BY CADE METZ Taking your show on the road no longer means sacrificing the power you're used to having with your desktop PC. Today's notebooks have it all, from 1GB+ hard disks and L2 cache to desktop-size displays and 6X CD-ROM drives. In this roundup of 58 Pentium-class portables, we test everything from budget-conscious, \$2,500 Pentium/100 machines with dual-scan displays to \$5,000+ Pentium/133-powered systems with multimedia features to spare—not to mention fully equipped sub-5-pound systems100

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Special Insert

1996 Travelers' Guide to Computing on the Road



If you've ever left on a business trip only to discover that you've left important phone numbers or other information behind, you'll appreciate our 1996

Travelers' Guide to Computing on the Road. Inside you'll find tips and tricks—as well as support numbers for the top ten notebook vendors—to help take the hassle out of mobile computing143

Hardware

The Top 35 Portable Peripherals



Once you pick the right portable PC to fit your needs, it's time to make the little wonder even more productive. We test five new PC Card devices, each delivering both a 28.8-Kbps fax modem and a ready Ethernet connection, and evaluate

[14 other PC Card peripherals to find the ones that can](#)

make your portable more productive. For printing on the road, we compare four new units that weigh little but print a lot. In case presentations are your province, we compare five portable LCD projection systems that can help you get your point across. We also test the best compact CD-ROM drives and speaker systems and even look at some bags and totes you can use to move your gear from point A to point B.....197

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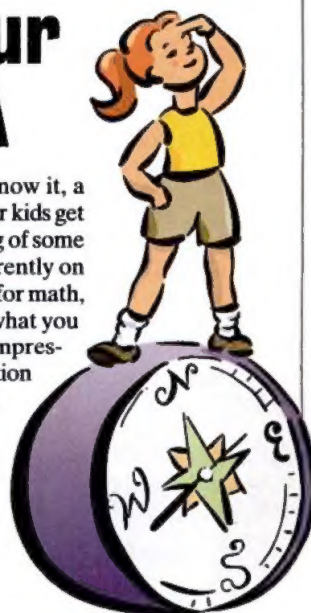
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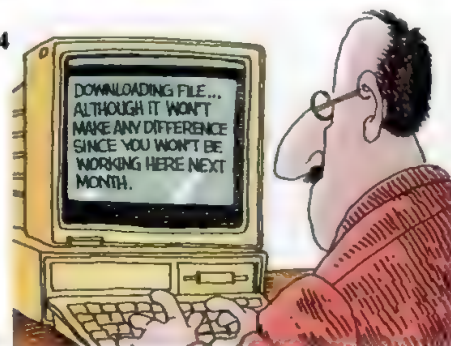
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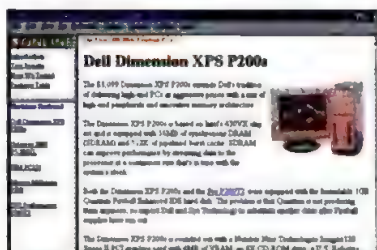
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What's New Online

With this issue's review of 58 notebooks, we are unveiling a new feature that allows you to interactively sort and filter benchmark test results and customize price/performance charts to your own criteria. For example, you can see how our charts change if you value portability above performance, or you can narrow down test results to compare only CD-ROM equipped notebooks under \$4,000. To take advantage of these features, you need a browser that supports Java.



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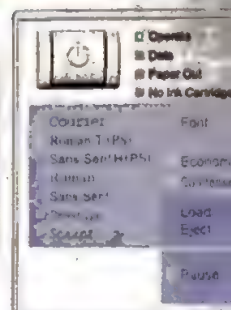
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JUNE 25, 1996
MILLENNIA P133



JUNE 25, 1996
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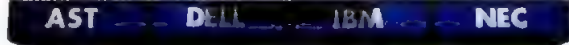
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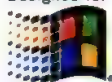
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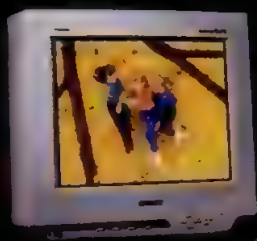
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Letters

REQUIEM FOR APPLE?

I'm writing in response to Jake Kirchner's column "Will We Miss Apple When It's Gone?" (April 9, 1996). Every year since 1984, experts have been predicting Apple's demise, yet you can see the result. The Macintosh has many strengths as a computing platform, including a loyal user base and a strong market presence in schools as well as in desktop and Internet publishing. Many companies sustain large losses yet return to profitability. It was not too long ago that many people were predicting the end of IBM.

ENRIQUE TERRAZAS
via the Internet

I concur with Kirchner's preference for a range of competitors. However, just having different brands of computer boxes is no proof of "a vibrant range of competitors"; not when these boxes all run Microsoft Word and Microsoft Excel (both parts of Microsoft Office), on Microsoft Windows 95, connected to the Microsoft Network, surfing the Web using the Microsoft Internet Explorer, and so on. Right now, Apple seems to be the sole significant alternative on the PC market and the only speed bump of any consequence on Microsoft's road to domination.

ADITYAJAYA DJOJONEGORO
via the Internet

We should care about the lack of competition, as Kirchner suggests, and even more so about the death of research and development advancements that will surely result if Apple changes its long-held stance of pouring profits back into its operating system and hardware.

APRIL GORNIK
via the Internet

I don't care about the marketing "hoovey" and business blunders of a string of Apple CEOs. Though at times dimmed by various idiotic moves from headquarters, elegant design and the appeal of simplicity have remained at the center of Apple's appeal.

LARRY HARRISON
Rochester, Minnesota

I've developed software for OS/2, OS/400, Windows, and the Mac. I now develop strictly for the Mac. It is a different atmosphere. I write software because I want to make a difference. I want to create solutions that make an unsophisticated end user say, "Wow! I didn't think I could do that with a computer."

JASON A. BOBIER
via the Internet

I first used a computer at the age of 52 and if it weren't for the Mac I wouldn't be computer-literate now. Sure, I can get three times as



many programs for the PC as for the Mac, and at a cheaper price, but what good is all that software if you don't know how to use the computer? I must say that I feel badly about the plight of Apple. I do hope it survives and helps other computer illiterates realize how easy, helpful, and time-saving it is to use a computer.

JEFFREY M. ROBERTS
via the Internet

People will always hate certain things: spiders, fur coats, and now British beef and, of course, Macs. So what is an article like this good for? Computer users don't want to see any more Mac-versus-PC discussions.

ROMAN GOETTER
Germany

IN THE EYE OF THE USER

A letter in the Databases section of PC Solutions (March 26, 1996) concerning the removal of FoxPro for Windows' Beautify function from Visual FoxPro caught my attention. Although you were correct in pointing out that the COB Editor Extensions can replace that functionality, the original feature still exists as a native function in Visual FoxPro by the name of Documenting Wizard. It can "beautify" an entire project in one pass, or individual programs one at a time.

STEVE WALTON
Chicago, Illinois

WHO'S GOT THE CHIPS?

In Michael J. Miller's March 26, 1996, column, "The Web Wore Black," he says that the Internet has "lost its innocence" because of the ban on material considered indecent for minors included in the Communications Decency Act. In fact, the ban did not alter any content on the Internet whatsoever. If it ever does—which is unlikely, since in typical political fashion the legislation was passed but cannot possibly be enforced—it will certainly not decrease any perceived "innocence." If more people were interested in

obeying the law, we would not have so many unnecessary laws.

BARRY ANDERSON
via PC MagNet

Royalty used to forbid people to trade goods outside their towns in order to control and tax the marketplace. If and when Internet becomes the select-and-search method for trading goods, the Internet will have to face becoming state-controlled. Never in history has government allowed tax-free trading.

MAGNUS STERKY
Stenungsund, Sweden

FOR RICHER OR POORER

John C. Dvorak's April 9, 1996, column, "The I-Way Is No Road to Riches," has dashed my hopes of fame and fortune on the Internet with its correct summary of the state of I-Way affairs. Both the flow of literary products and the right to reasonable compensation will be stifled by the carnivorous zeal of advertisers. The information superhighway was not intended to be a high-tech bulletin board, as Dvorak duly notes. I would hope our unions and trade associations would voice their concern over this.

BILL LACASSE
via PC MagNet

QUESTION AND ANSWER

The answer to the Trends article "Cyrix Scores: How does a 133-MHz chip outperform a 166-MHz chip?" (April 9, 1996) is that it doesn't. On the benchmark tests that smear their scores across CPU, video, and disk performance, the Cyrix-based machines won; on benchmark tests that are confined to CPU performance, the Cyrix machines lost. The Cyrix machines' disk and video subsystems overcome the weakness of their chips, which by themselves do not outperform a Pentium/166. The article completely misses this very significant point and unblinkingly toes the Cyrix line of superior performance being related to Cyrix's chips.

DAVID L. STAPLES
via PC MagNet

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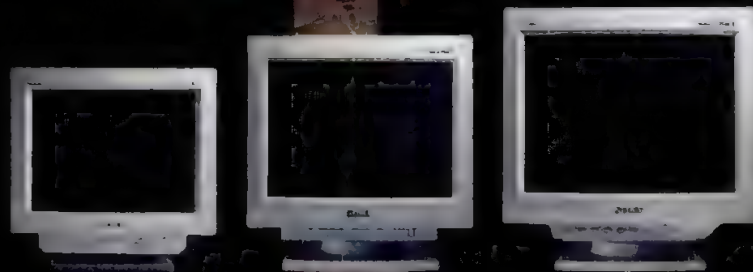


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Letters

UNINSPIRED

I am dismayed with your Editors' Choice of the Acer Aspire in your cover story "Hot Home PCs" (April 23, 1996). I have an Aspire P/133 and am totally dissatisfied with its performance. You say yourselves that its performance is "below average" and show it to have the lowest CPU performance of any machine tested. Since the only component of the machine that can't be easily upgraded is the CPU and cache, it seems to me that skimping in this area is the worst disservice a manufacturer can do.

GARY SOLOMON
via PC MagNet

Your review of the IBM Aptiva A50 describes the motherboard as having 256K of asynchronous external cache and a graphics adapter with 2MB VRAM. The Aptiva A50 as shipped by IBM actually has no external cache and 1MB DRAM on the graphics card. It seems then that the system you tested was upgraded significantly from the "standard" configuration. I think it's misleading for IBM to submit a product with substantial upgrades for your review, if that is the case. I might add that these memory upgrades are very hard to find except through IBM Direct.

GEORGE PAGE
San Francisco, California

It bugs me that you think more software is better. The Dell Dimension XPS P166c lost points in your roundup of home PCs because it had only Microsoft Office. I applaud

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CORRECTIONS AND AMPLIFICATIONS

In the June 11, 1996, After Hours review "The 'Bots Are Back" (page 393), we incorrectly reported that Interplay's Descent II was accelerated for use with the Diamond Edge 3D graphics card. An upgraded version of Descent II is in fact accelerated for the Diamond Stealth 3D card, which comes with up-graded software but was not yet available at the time of the review.

In "Fast Connections" (June 11, 1996), the cost estimate for ISDN service was listed incorrectly. The correct estimated cost for ISDN service is \$350 to \$500 up front and \$24 to \$60 per month, plus per-minute and ISP charges.

The May 28, 1996, Second Looks description of Rockwell RPI modem problems ("Bug Briefs," page 73) should have noted that the actual cause of the dropped connections is software configuration; <http://www.nb.rockwell.com> contains up-to-date configuration information.

In our April 9, 1996, review of customizable online news services, "News You Choose" (page 209), the sidebar titled "Custom News for the Corporate Site" misquoted the price for Reuters Business Alert. The correct price is \$950 a month for up to ten users.

Dell for its restraint. It's aggravating to untangle bundled software packages to figure out just what really is on a given machine. Worse are the manufacturers that add front-end helper software, often changing the underlying packages in the process. This stuff just gets in the way. There are those of us who would prefer to buy a high-powered box and load and configure the software and peripherals we want ourselves.

DAVID MOONEY
via the Internet

FEELING LEFT OUT

Your review of personal information managers ("Good-Bye, Rolodex! So Long, Sticky Notes!," April 23, 1996) struck me for its omission of Polaris Software's PackRat, once a high-flying alternative that fell on hard times after a disastrous Version 5.0 upgrade. I have continued to use PackRat, Version 4.1, for many years with satisfaction. I particularly like the ability to access the PackRat address book directly from Word for Windows.

PETER SHANAHAN
Acton, Massachusetts

HARSH REALITIES

Ami Rodan's letter about people who don't register shareware (April 23, 1996) illustrates that many people aren't willing to pay for quality software. The concept of shareware is based on the premise that people are basically honest and conscientious. Programmers toil late into the night perfecting programs that they think others might find useful or entertaining. Users who download and enjoy these programs should be glad to pay a modest registration fee in return for the value received.

HOWARD ZELIZER
via PC MagNet

A SHOW OF HANDS

I enjoyed reading Bill Howard's column "My Top 20 Questions" (April 23, 1996). In response to his question concerning why ink jet

printers can't be mounted: try a microwave cart. You can put a printer on top, in the microwave enclosure, and use the underneath cabinet for storage space.

JOHN KNAUER, JR.
via the Internet

Howard asks why vendors don't "label the switches and ports of PCs, printers, and scanners in English rather than using confusing icons?" Because the U.S. is not the hub of the world and because English is not necessarily universal. Similarly, the answer to his question concerning why modem, printer, and miniscanner vendors don't integrate power supplies into their units is that some countries don't like the thick wires and voltage drops associated with the United States' 110V and prefer to use a variety of higher voltages. Shopping the global market means being treated like everybody else in the global village.

PETER DONATSCH
Lyss, Switzerland

A SECOND LOOK

In his Inside Track column (April 23, 1996), John C. Dvorak addresses the possible demise of DVD, citing "the pathetic video laserdisk" as an example of a format that never got off the ground. As a laserdisk player owner, I must say that though the current format is not perfect, it has come light years from the late seventies-era technology Dvorak refers to. The main reasons the laserdisk never went mainstream were poor marketing, a high price point, and the unfortunate shared time line with the videotape standard. Dvorak needs to take a second look at the laserdisk format. Given the inherent shortcomings that the early DVD players and disks will exhibit if the agreed-on video and audio compression algorithms aren't dramatically improved, the laserdisk standard should remain a viable and cost-effective option.

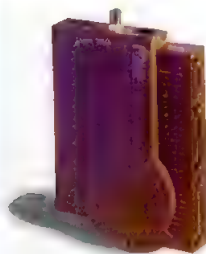
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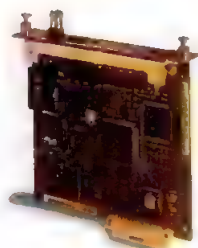
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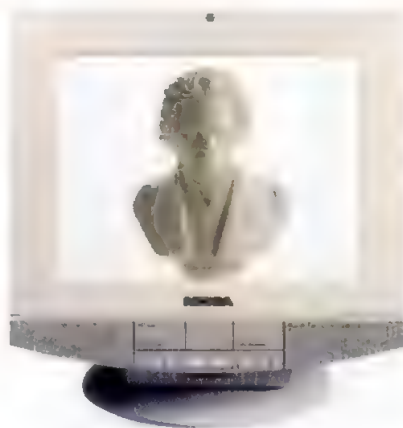
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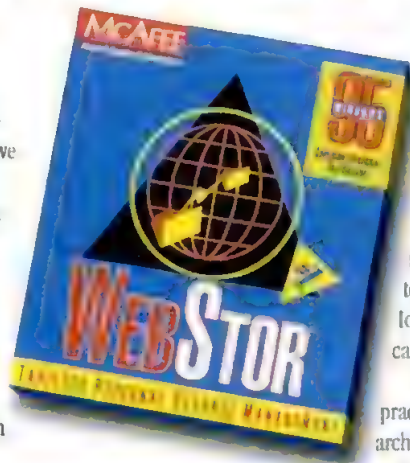
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Exploiting the Intranet

Remember local area networks? Client/server computing? They were all the rage a few years back. Nowadays, local area networks aren't so local anymore. In any medium or large company, the network is likely tied to other networks and to the Internet

and can be accessed remotely. And while the client/server concept sounded good, it didn't always work as advertised. Applications were difficult to develop and integrate with one another, and it was hard to connect internal applications with clients outside the network.

Today the buzzword is *intranet*, the concept of using Internet standards on networks to create open—but incredibly capable—applications. Netscape, Microsoft, and Lotus all recently announced their own intranet strategies, but they use such different languages, it's hard to tell whether any one company really sees the whole picture. Netscape is adding more network and groupware features to an Internet framework. Microsoft is integrating Internet features into existing operating systems and applications. And Lotus is taking its groupware standard and building in new Internet features.

Currently, Netscape is leading the intranet bandwagon. The company wants to turn your internal network into what it calls a "full-service intranet." This model would use open standards to provide information sharing and management, communication and collaboration, navigation and access to applications, as well as the four major network services—directory, replication, security, and management.

Netscape's plan includes new versions of its Navigator browser (code-named Galileo and due by year's end), with real discussion groups, secure e-mail, off-line e-mail functionality, new layout and forms features, and enhanced Java support. Orion, the next generation of SuiteSpot servers (slated for rollout in 1997), will add directory and replication services, agents, improved security, and more advanced application development and management. All of this is designed to create an "Internet OS" to challenge traditional groupware products such as Notes and network operating systems.

Microsoft has responded by repositioning the bulk of its line as intranet products. A planned update to Internet Explorer will include a new feature called Active Desktop that will enable you to view local files as though they were part of the Internet, with HTML pages showing what's in each di-



THE INTRANET IDEA

Today the buzzword is *intranet*, the concept of using Internet standards on networks.

rectory. By using this method to view files seamlessly across local hard disks, servers, and the Internet, Internet Explorer 4.0 promises to make navigating and working with documents easier than ever.

More surprising are Microsoft's plans to integrate its Office 97 applications with its intranet products, so you'll be able to view documents created with Excel or Word, for example, within your browser. You can even edit the document within the browser. At this point, we don't know how well this integration will really work, but it sure sounds cool.

While Netscape and Microsoft are making lots of noise, Lotus is quietly making a strong case that a lot of the new features the others are pushing—e-mail integration, replication, better security—have long been part of Lotus Notes. All the same, Lotus has been adding Internet features to its workgroup platform. A new version of Notes called Domino lets you use any Web browser to get complete access to all the data on Notes servers while maintaining Notes's built-in design, security, and replication features. Any Notes database will effectively become a series of Web pages.

Lotus is working on new versions of its clients and servers that will add features such as group scheduling and support for more Internet mail and security standards. One such server, Domino II, will be completely based on Internet standards for formatting, mail, and security. Lotus is also showing Net.Apps, a series of applications built on top of Notes and designed for setting up Web sites, as well as Components, Lotus's applets for performing specific tasks within the Notes environment.

Can any of these vendors deliver? Right now, we don't know. Netscape has lots of experience with Web servers, but not with groupware or network operating systems. Microsoft knows operating systems, but most sites are designed for Navigator, not Internet Explorer. And while Lotus Notes has the features, it lacks the mind share of pure Internet-based solutions. None of these solutions are likely to be complete, but they point the way toward a more integrated solution. □

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Trends

TRENDS & TECHNOLOGIES SHAPING THE PERSONAL COMPUTER MARKET

The Intranet Onslaught

Microsoft, Netscape, and Lotus shift the Net to corporate desktops.

The Internet is the global network that will stitch together companies and all kinds of customers," said Microsoft CEO Bill Gates at the company's recent Intranet Strategy Day in San Jose, California.

Gates made quite a few announcements regarding product plans, many of which revolved around Microsoft Windows NT. On the server side, Windows NT 4.0 should ship in the July/August time frame, with the 64-bit Windows NT 5.0 shipping by the second quarter of 1997. Windows NT 4.0 will integrate Microsoft's Front Page for Web authoring and site management and will offer sophisticated searching and indexing. A next-generation Windows NT Directory Server will be available to developers later this year, and Normandy—the platform on which the Microsoft Network is based—will be made widely available as a high-end public network server for telephone companies and CompuServe, among other customers.

On the client side, Gates emphasized the intranet features in the upcoming Office 97 applications suite and Internet Explorer, which will inherit Microsoft's Net Meeting technology for sharing applications. Gates also emphasized the Active Desktop—based on the use of ActiveX controls—as the key to Internet Explorer 4.0.

Office 97 will, according to Gates, "move us from a document-centric focus to a Web-of-pages focus where everything, including your desktop, is a page



with links." In one of several demonstrations, a Windows desktop displayed several Active Desktop features. The desktop itself was a Web page, featuring links to the intranet pages of a pharmaceutical

company, a rolling ticker of stock quotes, and a shortcut icon linked to a Web page.

Netscape and Lotus have responded to Microsoft's announcements with their own far-reaching

intranet strategies. Netscape has plans to integrate a next-generation version of Navigator, called Galileo, and a next-generation version of SuiteSpot, called Orion, into a full-service intranet strategy. Netscape is developing an Internet operating system that manages files and hosts apps. It's also making its server software cross platform. The company is betting on Sun's Java to usher in a new breed of cross-platform intranet apps.

Lotus has announced a new line of Web servers (code-named Domino II), including one based on Internet-only standards, as well as a line of Web servers, clients, and tools designed to integrate with Lotus Notes. The first in the line of Domino II Servers will feature a Notes-based object store and support for Common Object Request Broker Architecture (CORBA), to enable storage and retrieval of objects in many different formats.—*Sebastian Rupley*

The Web—Without the Wait

The latest in high-speed phone lines.

For the serious Web surfer, it would be a dream come true: simultaneous voice service and Web access—at speeds of up to 400 times as fast as a 14.4-Kbps modem—all over a single phone line. That's what AT&T Paradyne, based in Largo, Florida, is promising with its new GlobeSpan Rate Adaptive Digital Subscriber Line (RADSL) technology.

RADSL holds out some tantalizing features: Web-site graphics that require 6 minutes to display over a 14.4-Kbps modem appear in less than 1 second over RADSL's 600-Kbps to 7-Mbps "downstream" channel from the Web to your PC. The "upstream"

channel blasts data back to the Web at 128 Kbps to 1 Mbps.

RADSL is a variation of ADSL (Asymmetric Digital Subscriber Line), which phone companies conceived as a way to deliver movies. (ADSL specifies a 6-Mbps channel from the phone company's central office to your PC and a 64-Kbps channel in return.) This concept was fine for its original purpose but isn't so great for the Internet. RADSL speed adapts based on the length

and signal quality of an existing phone line, ensuring higher-quality transfer over longer distances.

AT&T Paradyne is positioning GlobeSpan RADSL as a way for phone companies to protect their customer base against other Internet access technologies,

especially cable. But

don't count on either technology to reach your PC anytime soon. The local phone companies will have to

install complex digital backbone systems, and the

cable firms face the investment in two-way cable.

Meanwhile, wireless Web access may turn out to be the real challenger.—*Frank J. Derfler, Jr.*



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Internet Phones Take Shape

The first ones will arrive this summer.

Northern Telecom and Sun Microsystems have joined up to incorporate Sun's Java software platform and Java-powered chips into telephones for a host of intranet and mainstream Internet applications.

The costs for the phones will be in the \$500 range, and many ap-

Nortel and Sun is aimed at letting developers create unique Java-compatible applications and services. Customer trials are expected to take place in 1997.

"We want an open system that will compel software developers to create all kinds of applications for enhanced telephony," said Rick Faletti of Nortel.

Details on the technology be-

hind the Nortel/Sun phones aren't available yet, but AT&T is also gearing up to ship its Internet phone later this year. The \$500 phone (with \$50 to \$80 average monthly service charges) is a standard cellular phone, capable of 19.2-Kbps data transfers; it can access a subset of the Web's pages via a dedicated AT&T server. The phone has a 3-line, 22-character-wide screen designed to access pages formatted in HDML, an HTML offshoot.

AT&T's phone will target cor-

CALLING INTRANETS: AT&T's phone/browser will retrieve corporate data.

porate intranet applications, such as instant access to sales data. In demonstrations, the phone accessed Federal Express's Web site to track a package, got stock quotes, checked the weather, and accessed Web-based flight-reservation information. AT&T will make a software development kit available later this year.—*Sebastian Rupley and Brian Nadel*



JAVA PHONE: Nortel foresees Java apps on its Internet phone.



plications are targeted at accessing Internet services. For example, a realtor could use one of the new wireless or desk telephones to call up an Internet multilisting database for a brief description, a price, and even a small photo of a piece of property—all displayed on the telephone's screen.

Nortel plans to demonstrate Sun's Java technology in its screen-based telephones this summer. The agreement between

The Net, via Thin Air

Wireless Internet service reaches more cities.

It sounds like a fantasy: unlimited, wireless Internet access for 30 bucks a month. In a few U.S. cities, that fantasy is as real as the wired connections to which the rest of us are chained.

Metricom, a Los Gatos, California-based Internet service provider, offers freedom from the phone system with transmission rates that rival wired connections of 14.4 to 28.8 Kbps. Metricom provides this service via a system of shoebox-

size radios spaced at half-a-mile intervals and mounted atop utility poles. Users access this local-packet radio network via Metricom's Ricochet radio modem, a small external box that costs \$299 to buy or \$10 per month to rent, in addition to the costs of Metricom's Internet service provision.

The Metricom network connects to the wired world via Wired Access Points (WAPs), which receive 1K packets from the pole-top radios and pass them to Metricom's frame-relay network. The company is in the process of installing a nationwide frame-relay backbone.

The Ricochet modem communicates with Metricom's network via a standard TCP/IP link. That leaves you free to use any TCP/IP software, including the Windows 95 TCP/IP stack and browsers such as Microsoft Explorer and Netscape Navigator.

If there's a fly in the ointment, it can be summed up in a single word: coverage. Metricom's technology must be installed on a locality-by-locality basis, which means getting permission from local city councils. So far, the company has wired the entire San Francisco Bay area and will bring Seattle and Washington D.C. into the system this summer.

"It's our objective to be nationwide," Wood says. He estimates—

perhaps optimistically—that it'll take two to three years to cover all of the major U.S. cities. College campuses, including Berkeley and Stanford, are among the first areas in Metricom's network. The Bay area airports are already online, and D.C.'s Dulles and National airports are on the agenda. The network is also in use at Microsoft's Redmond headquarters.

"This is extremely real," says Dan Croft, a product manager in Hewlett-Packard's OmniBook division. HP uses the Metricom sys-



WIRELESS WEB: The Ricochet modem accesses Metricom's expanding radio network.

tem at several of its campuses. "We have quite a few people outfitted with the Ricochet modem," he reports, "and we're using it for both Internet and intranet access."

If it does go nationwide, Metricom could represent stiff competition for packet radio networks like ARDIS and RAM Mobile, which don't provide direct TCP/IP connectivity. "Right now they're complementary services," says Croft, adding that "Metricom is great if you're in a covered metropolitan region. RAM is great if you're mobile between regions."—*Jonathan Matzkin*

PC Magazine Online Events



WWW.PCMAG.COM. With this issue's review of 58 notebooks, PC Magazine Online is unveiling an interactive feature that lets you sort and filter benchmark test results and customize price/performance charts to your own criteria. (You'll need a browser that supports Java.) From August 5 to 9 you can go online to discuss educational software with associate editor Mike Ryan, reviewer Kathy Yakal, editorial assistant Mary Paulson, and staff editor Michelle Schoenung.

PC MAGNET. From this online service of ZD Net available through CompuServe (GO PCMAGNET), you can download PC Magazine utilities (GO TIPS) and join in freewheeling discussions about new products (GO EDITOR). **First Looks Plus:** From July 22 to 26, discuss Windows 95 books with their authors and reviewer Jeff Prosis. From July 29 to August 2, learn more about the Canon PowerShot 600 digital camera with reviewers Daniel Grotta and Sally Weiner Grotta and Canon representatives. From August 12 to 16, discuss off-line browsers with reviewer Ed Mendelson. **Features Plus:** From July 22 to 26, you can go online to discuss portable peripherals with our reviewers in conjunction with this issue's roundup.—*Tin Albano*

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Dusting for Prints—On Your Intranet

Fingerprint ID technology for the PC.

As widespread Internet commerce looms closer and corporate intranets proliferate, an unsung security technology—fingerprint identification—is heading for high-profile commercial uses. Companies big and small, including Harris, Identix, Oracle, and Verifone, are now preparing fingerprint ID solutions.

According to Karl McCalley, vice president of Harris's Authentec division, "Fingerprint ID technology has dropped in price dramatically, and it beats password schemes, because a password can be used by anyone."

Harris has developed an inexpensive line called FingerLock



Products that will show up first in portable PCs from several as-yet-unnamed manufacturers. Harris's FingerLock mechanism for

POSITIVE ID: Identix's fingerprint ID device collects 250K of digitized data.

portables is based on a matchbook-size platen that sits on top of an integrated circuit. To gain access to the notebook, the owner places a finger on the platen and a chip collects fingerprint ID data (called minutia), which is then matched with the owner's previously saved set of minutia. McCalley says the device costs under \$100.

Oracle is working with Identix of Sunnyvale, California, to incorporate support for Identix's fingerprint ID hardware and software into the Oracle 7 database. Identix's devices work much like

Harris', and prices are in the \$200 to \$500 range. Identix's CEO, Randy Fowler, says the devices will start showing up soon in several intranet environments that use Oracle databases.

Fingerprint ID technology still faces several hurdles. Costs are still relatively high for fingerprint ID devices, although Identix's Fowler says volume could drive the costs way down. Competitors, such as Microsoft's digital signature technology, also loom. Still, fingerprint IDs are extremely accurate—with an error rate of about one read in 100,000 transactions, according to Verifone's Lewis—and a fingerprint can't be owned by more than one person. According to Identix's Fowler, "electronic commerce is not really going to happen until this kind of total security is in place."—*Sebastian Rupley*

Intel Pushes Pentium Pro

Videoconferencing and "hybrid apps" drive production.

At Intel's annual New York Analyst Meeting in the spring, talk of microprocessors was but a side dish. The company's end-of-millennium plans—as outlined by its executive officers—involve smaller, faster versions of the Pentium Pro, although the industry's leading chip manufacturer is also showing serious devotion to Internet multimedia and to what it calls "hybrid applications."

As Craig Barrett, executive vice president and chief operating officer, explained, Intel continues to adhere to Moore's Law, which states that the number of transistors per chip doubles every 18 months. The company predicts that silicon scaling will reach its physical limit by the year 2017. Meanwhile, current manufacturing processes continue to deliver higher performance from smaller chips. A new 160,000-square-foot chip factory—Intel's twelfth—will initially adopt the 0.35-micron process that Intel has used since 1995, but will then adopt the 0.25-

micron Pentium Pro process by the middle of next year. By then, production of the Pentium Pro will have surpassed that of the Pentium.

According to Intel executive vice president Gerry Parker, smaller die sizes will lead to faster production, or "ramp," for the Pentium Pro. As the number of processors that can fit onto a wafer increases, the defect density of each wafer stays the same. As a result, the number of defective chips decreases.

The Pentium Pro, the company predicts, must ramp faster in order to keep up with two software trends: increased Internet use and the widespread adoption of Microsoft Windows NT 4.0. Intel's primary goal is to drive the "Connected PC," a multimedia machine that offers Internet access, videoconferencing, and Universal Serial Bus support. To this end,

the company is focusing on its ProShare videoconferencing software and the promotion of "hybrid applications"—multimedia apps that deliver complex content via CD-ROM and use the Internet for interactivity.

Intel ProShare, which already controls 42 percent of the ISDN videoconferencing market, has just entered a second release that's multipoint-enabled and multilingual. More important, ProShare VideoPhone for the Home plugs into an ordinary phone jack.

Most impressive is Intel's InterCast project, which is designed to deliver Web pages over broadcast TV signals. An InterCast browser receives the signal, displays the TV feed, and caches Web pages so you can delve deeper in a program's subject matter as it airs.—*Cade Metz*

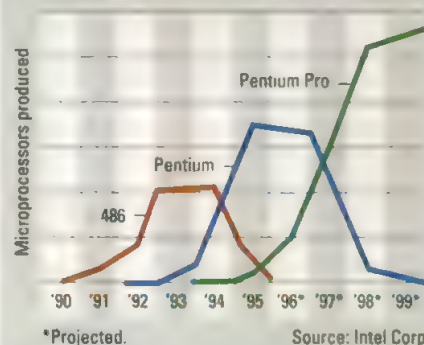
Top CD-ROMs

- 1 **Microsoft Windows 95 Upgrade** Microsoft
- 2 **Warcraft II: Tides of Darkness** Blizzard Entertainment
- 3 **Civilization II** MicroProse Software
- 4 **Print House for Windows 95** Corel
- 5 **Myst** Broderbund Software
- 6 **Print Shop Deluxe CD Ensemble** Broderbund Software
- 7 **TurboTax Deluxe** Intuit
- 8 **Toy Story Animated StoryBook** Disney
- 9 **Microsoft Plus! for Windows 95** Microsoft
- 10 **Quicken Deluxe** Intuit

*Source: PC Data. Data for May 1998.

Processor Life Cycles

With more efficient manufacturing methods, Intel is able to ramp up Pentium Pro production quickly and meet market demand faster.



By Jake Kirchner

Japanese Firms Have a New Yen for U.S. PC Dollars

One of the enduring mysteries of the PC industry has been the near nonexistence of Japanese computer makers here in the U.S., the world's largest market. Granted, NEC has gradually built decent market share in the consumer market, and Toshiba's U.S.-based subsidiary continues to be a leader in the portable field, but without exception, the major players for the last 10 years have been homegrown companies. (The Japanese, of course, have been major component suppliers.)

Perhaps emboldened by the quick success here of Taiwanese PC-manufacturer Acer, key Japanese computer and electronics firms are now making forays into the market dominated by Apple, Compaq, Dell, Gateway, Hewlett-Packard, IBM, and Packard Bell.

Fujitsu and Hitachi are hoping to move beyond the mainframe business and build U.S. market shares in notebooks, a segment in which Hitachi already dabbles. Toshiba is looking to parlay its industry-leading position in notebooks into equal prominence in desktop computers. And Sony, ending a 12-year hiatus from the PC world, is jumping into the home-PC side of the business with a new lineup of high-end multimedia machines.

It's too early to predict how well these companies will do in the U.S., but it's safe to say they face an uphill road to gain enough market share to be profitable. Even the industry leaders have learned that the PC business is a tough way to make money. Constantly evolving technologies, razor-thin profit margins, expensive support operations, and tight-fisted, hard-to-please cus-



It's safe to say the Japanese firms face an uphill road to gain the market share they'll need to be profitable.

tomers make it extremely difficult to realize a profit.

Many of the top vendors over the last couple of years—Apple, AST, IBM, and Packard Bell, to name the most prominent—have struggled to attain or retain profitability in hardware sales. The failures have come about for diverse reasons, from high R & D costs to misjudged customer demands, but in this fast-paced, volatile industry, even the simplest misstep can mean hundreds of millions of dollars in annual losses.

Given these market realities, why is the PC business expanding so rapidly? No doubt, it's because the market is so huge and growing so quickly, it's impossible to sit on the sidelines. And, let's face it, it is possible to make money. Companies targeting specific niches that allow better margins do nicely, and companies with manufacturing efficiency and marketing prowess make up in volume what they can't attain in profit margins.

As for the Japanese firms renewing their efforts in the U.S. market, there's nothing in their individual product lineups, strategies, or distribution schemes that suggests they'll push aside the currently established players in short order. Any new player's best chance at gaining quick market share is to buy it by

being the price leader. Unfortunately, it's a tactic several current leaders have perfected—in many cases to their own financial dismay. So it's unlikely the Japanese firms will go that route.

The bottom line? Look for it to take at least several years before any of these firms climb to the top of the heap.

It's a Sony—PC

Targeting the home market.

Sony Corp. reentered the personal computer business in June when it introduced the PC by Sony home computer, a high-end machine priced between \$2,000 and \$3,000, without a monitor. Sony expects to ship the first Windows 95 machines to consumer-electronics retailers such as Best Buy the first week of August.

In returning to the market (12 years ago, Sony introduced the first PC with a 3.5-inch floppy disk drive), Sony is setting its direction for the next 50 years, says Takashi Sugiyama, director of marketing for PC products for Sony Information Technologies of America, a new U.S.-based arm of the electronics and entertainment giant.

Inside Sony's new PC, you'll

find a 166-MHz or 200-MHz Intel Pentium processor, a 2.1GB or 2.5GB hard disk, 16MB of RAM, an ATI 3-D accelerator with 2MB of video RAM, a software-based MPEG 1 decoder, a Sony 8X CD-ROM drive, and a Sony 28.8-Kbps modem for simultaneous voice and data. Sony has also outfitted the motherboard with a Universal Serial Bus (USB) connector for the easy hookup of peripherals.

The monitor is the key differentiator, says Sugiyama. The 15-inch Sony-made monitor (a 17-inch model will be available next year) has a microphone, a subwoofer in its base, a full-duplex speakerphone, and SRS 3-D sound.

Sony's plans are twofold: to give home users a fantastic computer-based video and sound experience and, perhaps more strategic, to create synergy between its consumer-electronics

and computer businesses.

"We see the opportunity to expand the peripheral business," says Sugiyama. In fact, every division of the company is looking into converging consumer electronics with information technology.



VERY VAIO: Sony spotlights video and audio.

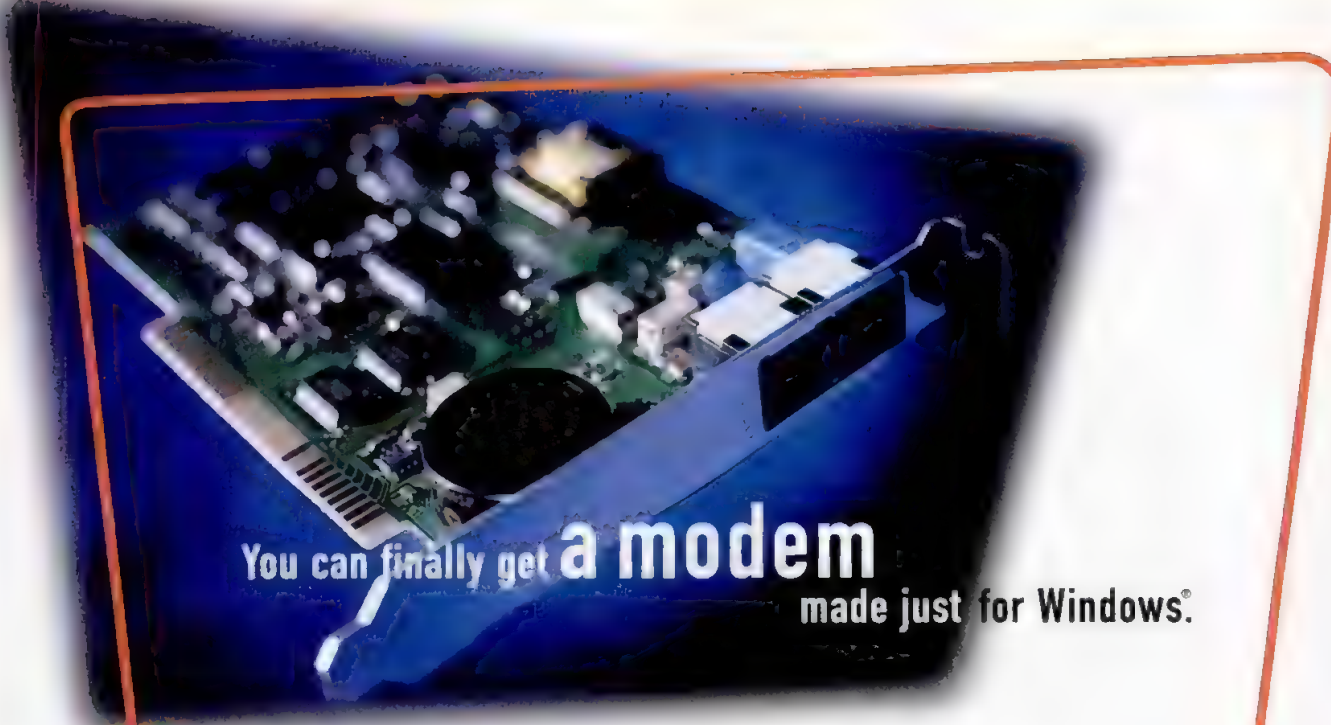
gy, making TVs, VCRs, camcorders, and stereos work with PCs.

"Sony clearly has the intention of having a multiple product line," says IDC/Link's Walter Miao.

"They've got an excellent strategy," he says of Sony's USB plans, "that's more in concert with the consumer-electronics approach." Sony has introduced a USB-based 100-CD changer that stacks on top of the Sony PC's mini-tower. Sony has also introduced the PC Vision Touch, a USB receiver for remote control of Sony products.

Despite today's cut-throat market, Sony thinks its timing couldn't be better. Nearly half of all new PCs are bought for the home, Sony has strong brand equity, and Sony sees the integration of audio, visual, computers,

and communications—what it calls VAIO, for Video Audio Integrated Operations—as a natural extension of home entertainment systems.—Carol Levin



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First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

PORTABLE PCs

Thin Is In: A Whole New Species Of Subnotebooks Has Arrived

By Brian Nadel

Take a slice of earth and you might find fossils of several competing species that from a distance look very similar. On closer examination, though, one will likely have an essential advantage over its competitors. Similarly, the subtle evolution of subnotebooks, brought about by intense competition, has yielded major technological advances evident in the latest round of offerings.

Earlier subnotebooks sacrificed performance and features for size; they lacked full-size screens and the most-up-to-date processors. Others were simply overgrown hand-held communication devices that were not compatible with the most popular software. This quartet of new subnotebooks, Compaq's Armada 4120T, Fujitsu's Montego T100, the Hitachi C120T, and Toshiba's Portégé 650CT, suffers from none of these problems. All are high-powered, full-featured PCs that fit a little better in your briefcase and feel a little lighter on your shoulder.

The subnotebook market is dominated by two additional com-

petitors in the "thin is in" category. Both the IBM ThinkPad 560 and Digital HiNote Ultra II are 1.3 inches thick, but the ThinkPad 560 incorporates a stunning 12.1-inch color display, while the HiNote Ultra II has a clip-on CD-ROM drive. (See "Portable Property" in this issue.)

The four subnotebooks reviewed here have a lot in common. They are equipped with sound, at least one PC Card slot, Pentium processors, high-resolution, active-matrix color screens, lithium ion batteries, and built-in infrared wireless communications. Unlike most of their predecessors, the Armada and the Montego also allow you to choose either an internal floppy disk drive or an external drive device, which provides room for an extra battery. The Portégé continues to treat its floppy disk drive as an outsider. The Hitachi C120T's floppy disk drive is integral to the unit, so it can't be swapped for another device—but it can't be lost or left in a hotel room either.

The Portégé rides tall—a little too tall—in the saddle, ignoring the trend started by IBM's ground-breaking ThinkPad 560 toward thinner and lighter de-



FLOTILLA OF FEATURES: The Armada's slim profile belies its travel weight with the optional Mobile CD-ROM unit attached.

signs. This Portégé is about one-third of an inch wider and deeper than, and just as heavy as, the 610 model it replaces. By contrast, at just 1.5 inches thick, the Armada makes a virtue of thin-

ness; ironically, it is the heaviest system of this group. The Armada gives you the bonus of a snap-on CD-ROM drive that is similar to the one used on Digital's HiNote Ultra II, but you pay the price in additional bulk. The Montego is the lightest system of the group and the best value, and the Hitachi C120T has the most comfortable keyboard and places an emphasis on communications.

Of the four, the performance champ was the Portégé, which had the benefit of a 133-MHz Pentium processor; the others got by ably with 100- or 120-MHz CPUs. The leader in battery life was the Armada, but it still lagged behind IBM's ThinkPad 560, the current subnotebook battery boss. Which one you should choose depends on what you use a portable PC for. The Portégé occupies the upper limit of subnotebook performance and features, while the Armada is a good choice if you're not going to see a power plug very often. The Montego is ideal for those who value a small and light package, and the Hitachi C120T is well suited for keeping in touch while on the road.

In addition to the four systems we evaluated, expect to see a Hewlett-Packard OmniBook that is thinner, lighter, and more powerful than the present

IN THIS EDITION OF FIRST LOOKS

Off-line Browsers
America Online 3.0
Corel Web Graphics Suite
RealAudio 2.0
PowerShot 600
Kurzweil Voice 2.0
Modula Executive Desk Pad
E-Mail Connection 3.0
ZIP Express
Colorwriter LSR 2000
PowerShot 600
Seven Habits Tools
Windows 95 Guides



◀ **NOTHING BUT NET:** Off-line readers allow you to browse the Web at your leisure without running up big phone bills. Reviews start on page 43.

OFFICE COLOR: DEC's new ▶ network laser printer combines workgroup power with high-quality color printing. See page 63 for the full review.



First Looks

model; a Twinhead Slimnote that comes close to the ThinkPad 560 in many respects but has an internal floppy disk drive; and a Sharp system that takes the slim-profile design to the extreme and uses the company's low-power Super High Aperture screen technology.



TRAVEL COMPANION: The Montego trades a large screen for the lightest travel weight and the lowest price tag.

Only time will tell whether any of these subnotebooks will come to dominate the portable computing landscape, or if they'll become evolutionary dead ends. One thing is certain, though: The multitude of high-powered, small systems shows that subpar subnotebooks have gone the way of the dinosaur.

COMPAQ ARMADA 4120T

With a profile borrowed from Digital's HiNote Ultra II, Compaq's Armada 4120T sets the pace in terms of thinness, multimedia capabilities, and CPU performance. At 1.5 by 11.6 by 10.3 inches, the \$3,899 Armada is a finger's width thicker than IBM's ThinkPad 560, but its 7-pound travel weight makes it the heaviest in this group. (System weight is 6 pounds.)

Add the \$399 Mobile CD-ROM unit that attaches underneath the system and the Armada becomes a capable presentation machine. This add-on, however, increases the Armada's thickness to 2.3 inches, and total weight increases to about ten pounds. Although having a

built-in quad-speed CD-ROM drive gives the Armada an obvious advantage over its competitors, we suspect many buyers will opt for a smaller and lighter external, portable CD-ROM drive.

The Armada we tested came equipped with a Pentium/120 processor, an 810MB hard disk, and 256K of external cache. The Armada's 11.8-inch active-matrix screen displayed 800-by-600 resolution with 65,000 colors.

Flexibility is the watchword for the Armada. The system can carry a pair of lithium ion batteries. A primary cylindrical cell resides in its pull-out handle, and a rectangular primary internal cell fits in the floppy disk drive bay. This battery-in-handle approach is a nice touch for those who plan to leave their briefcases at home or for those who carry portable PCs around a lot.

In a design reminiscent of IBM's butterfly notebook, the ThinkPad 701C, the Armada's keyboard automatically recesses as the lid nears the keyboard. In addition, there's a pair of speakers on the wrist rest, and the Armada's case can accommodate either a touch pad or a trackball pointing device. Both worked well in testing, and we liked this design versatility.

The Armada proved itself to be as powerful as a fleet of lesser PCs on our CPU benchmark tests. Despite having a less powerful processor, the Armada's CPU benchmark scores were just behind those of the Portégé. Boosted by a Cirrus Logic video accelerator, the Armada scored an impressive 10.5 million pixels per second on our Graphics WinMark 96 graphics tests, and its Winstone 96 and Winstone 32 scores were in the running with those of full-size notebooks. The Armada led this group in terms of battery life, but the system requires a three-prong, grounded outlet for recharging.

Although it starts out thin and light, the Armada 4120T can end up being thick and heavy if you choose all of its options. Having

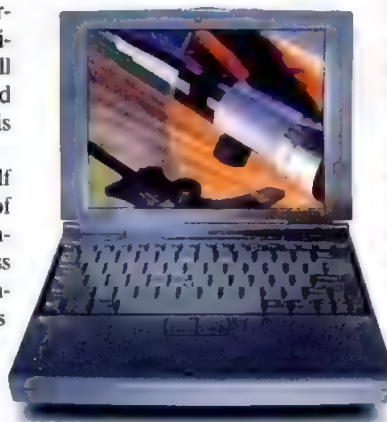
those choices can be a big bonus, however, with the multitude of computing situations that arise today.

Armada 4120T. List price: With Pentium/120 CPU, 256K external cache, 16MB RAM, 810MB hard disk, 11.8-inch active matrix display, \$3,899. Compaq Computer Corp., Houston, TX; 800-345-1518; <http://www.compaq.com>. Circle 437 on reader service card.

FUJITSU MONTEGO T100

The first of a family of three notebooks from Fujitsu, the \$3,499 Montego T100 has the lightest travel weight and the lowest price tag in this subnotebook group. As a result, the Montego may be the one you end up actually taking on the road.

At 1.9 by 8.3 by 10.2 inches, the Montego is a lean machine. To maintain its low system weight of 4 pounds 13 ounces and its 6 pound travel weight, however, the Montego had to forgo a state-of-the-art display for a merely adequate 10.4-inch screen, which displays up to 800-by-600 resolution with 65,000 colors.



KEEP IN TOUCH: The Hitachi C120T features a built-in V.34 modem, leaving the PC Card slot open for a network card.

The Montego lets you swap the internal floppy disk drive for a second lithium battery. Or you can insert a blank plate, leaving the floppy disk drive bay vacant, which makes the system even easier to carry. Unfortunately, you can't run the floppy disk drive externally—it's an either/or situation. When it comes

time to charge the batteries, you'll need a grounded outlet, because the Montego, like the Armada, needs a three-prong plug for its power adapter.

The system that we looked at came equipped with a Pentium/100 processor, a 1GB hard disk, and a keyboard-mounted pointing stick. Powered by the least-capable CPU of the group and lacking external processor cache, the Montego didn't dazzle us in benchmark testing. On the other hand, it performed consistently well and proved to be reliable.

If size, weight, and price are your top three priorities, the Montego T100 is for you.

Montego T100. List price: With Pentium/100 CPU, 16MB RAM, 1GB hard disk, 10.4-inch active-matrix display, \$3,499. Fujitsu PC Corp., Milpitas, CA; 408-935-8800; fax, 408-935-1552; <http://www.fujitsu-pc.com>. Circle 438 on reader service card.

HITACHI C120T

Hitachi has begun its foray into the American notebook market with the \$4,862 C120T model, a full-powered subnotebook that emphasizes communications features.

The Hitachi C120T is powered by a Pentium/120 CPU, and it has a 1GB hard disk and a bright and clear 11.8-inch active-matrix screen that is capable of displaying 800-by-600 resolution with 256 colors. All this fits into the Hitachi C120T's 1.6-by-8.9-by-11.7-inch case. The system weighs just 5 pounds 11 ounces; its travel weight is 6 pounds 6 ounces.

The key to the Hitachi C120T's design is its internal V.34 modem, which can transfer data at up to 28.8 kilobits per second (Kbps); at present, there is no upgrade available for 33.6-Kbps communications. On account of the internal modem, Fujitsu engineers included only one Type II PC Card slot, whereas the other three systems reviewed here offer a pair of Type II slots.

Just a hair thicker than the

First Looks

Armada, the Hitachi C120T is quite a bit wider, allowing for a full-size keyboard. There were no Windows 95-specific keys, but the system does have a responsive stick pointer for maneuvering the cursor. The Hitachi C120T lagged behind the Pentium/100-based Montego on all our performance tests. Its Graphics WinMark 96 score of 6.3 million pixels per second put it in the portable PC cellar.

If keeping in touch with your office is critical, the Hitachi C120T is the subnotebook for you.

Hitachi C120T. List price: With Pentium/120 CPU, 256K external cache, 16MB RAM, 1GB hard disk, 11.8-inch active-matrix display, \$4,862. Hitachi PC Corp., San Jose, CA; 800-448-2244, 408-321-5000; <http://www.hitachipc.com>. Circle 439 on reader service card.

TOSHIBA PORTÉGÉ 650CT

At a time when portable PCs are slimming down, the \$4,499 Toshiba Portégé 650CT is bulking up with high-end features and one of the best keyboards available.

With dimensions of 1.8 by 10.3 by 8.2 inches, the Portégé is a potential briefcase buster. And keep in mind that the Portégé uses an external floppy disk drive. By it-

self, the system weighs just 5 pounds, but with the power adapter, the travel weight is 6 pounds 7 ounces.

Within the Portégé's familiar



POWER PLAY: The Portégé has the fastest CPU, largest hard disk, and best display of the group.

gray shell beats a 133-MHz Pentium CPU (the fastest of the group). There's a 1.3GB hard disk (the largest of the group) and a crisp 11.3-inch color screen capable of displaying 16 millions colors at 800- by 600-pixel resolution.

As expected, the Portégé has set a new standard for subnotebook keyboards, even when compared with the IBM ThinkPad 560's, which most

closely resembles that of a desktop PC. Toshiba has redefined notebook keyboards by building a scissors mechanism below each key that activates the key even if you strike the side of it. At a width of 18 mm, each key is 1 mm wider than those on the Portégé 610 but smaller than the 19-mm key that is standard on desktop PCs. The Portégé adds Windows 95 keys, but they are tucked away in the upper-right-hand corner of the keyboard.

Like Toshiba's Tecra 720CDT (First Looks, June 25, 1996), the Portégé pioneers the incorporation of Zoomed Port Video (ZPV). Few peripherals are currently available for this technology. But as we went to press, Smart Modular, the manufacturer of Toshiba's Noteworthy accessories, announced a Type II PC Card that enables MPEG-1 video playback for ZPV-capable notebooks. Like the Hitachi C120T, the Portégé integrates a V.34 modem; the other systems rely on PC Card modems.

The other three subnotebooks reviewed here are Windows 95 systems, whereas the Portégé can also run Windows NT. The catch is that Windows NT has spotty support for power management, PC Cards, and infrared wireless communications.

Toshiba has addressed some but not all of these deficiencies.

With the fastest CPU of the group, the Portégé led the pack in benchmark testing. Its Graphics WinMark 96 score of 13.3 million pixels per second begins to rival the performance of desktop PCs. The system's graphics performance is based on Chips and Technologies' HiQVideo graphic accelerator with 2MB of VRAM. The unit's Winstone 96 score of 52 places the Portégé in a distinguished class of power notebooks.

On the downside, the Portégé continues to rely on a cooling fan that is controlled by a thermostat. The fan didn't activate during our evaluation, but you still have to carry it around with you. In addition, its 1-hour-40-minute battery life was disappointing.

Like a weight lifter on anabolic steroids, the Portégé 650CT is stout and muscular without an ounce of fat.

Portégé 650CT. List price: With Pentium/133 CPU, 256K external cache, 16MB RAM, 1.3GB hard disk, 11.3-inch active-matrix display, \$4,499. Toshiba America Information Systems Inc., Irvine CA; 800-457-7777, 714-583-3000; <http://www.computers.toshiba.com>. Circle 440 on reader service card.

BENCHMARK TESTS

Subnotebooks



The Toshiba Portégé 650CT was the only subnotebook in our roundup that came equipped with a Pentium/133 processor—and it showed. The Portégé posted the best scores in nearly every category but lagged in battery life. Its ZD Winstone 96 and ZD Winstone 32 scores of 52 and 61, respectively, were about 15 percent better than those of the closest competitor, the Compaq Armada 4120T, a Pentium/120-based subnotebook.

The Armada's ZD BatteryMark result of 3 hours led the

group, but was more than half an hour short of the IBM ThinkPad 560's result, which is reported for comparison. The Fujitsu Montego T100 was the lightest subnotebook we tested, though nothing reviewed here could match the Digital HiNote Ultra II CT55120 or the ThinkPad in that respect.

To measure performance, we used ZD Winstone 96, Version 1.0; ZD Winstone 32, Version 1.0; and ZD WinBench 96, Version 1.0. We used ZD BatteryMark to measure battery life. Each unit was equipped with 16MB of RAM and ran Microsoft Windows 95.

	ZD Winstone 96 Score	ZD Winstone 32 Score	ZD Graphics WinMark 96 Pixels/sec	ZD Disk WinMark 96 Score	ZD CPUmark ₃₃ Score	ZD CPUmark ₃₂ Score	ZD BatteryMark Hours:minutes	System weight [†] Pounds	Travel weight [†] Pounds
Compaq Armada 4120T (Pentium/120)	45	54	10.5	558	218	214	3:00	6.0	7.0
Digital HiNote Ultra II CTS5120 (Pentium/120)*	42	49	10.5	662	169	155	3:02	4.0	4.7
Fujitsu Montego T100 (Pentium/100)	40	48	9.4	688	153	149	1:35	4.8	6.0
Hitachi C120T (Pentium/120)	38	47	6.3	629	184	180	2:00	5.7	6.4
IBM ThinkPad 560 (Pentium/120)*	37	47	9.2	605	178	172	3:38	4.1	4.8
Toshiba Portégé 650CT (Pentium/133)	52	61	13.3	658	252	249	1:40	5.0	6.4

* Reported for comparison. [†] For explanations, see page 165.

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WEB BROWSER ADD-ONS

Off-Line Readers Deliver the World of the Web to Your Hard Disk

By Edward Mendelson

Off-line readers are utilities that download a World Wide Web site—complete with links and graphics—from the Internet to your disk so you can

more portable, but it can save you online connection charges by transferring only what you want.

In general, using these utilities is simple: Enter the URL of the Web page where you want to

side the domain of the starting page. The five programs we reviewed—FreeLoader, Internet Marauder, Smart Bookmarks, WebEx, and WebWhacker—rank among the most innovative

Open Market's OM-Express (<http://www.openmarket.com>).

Of these five, FreeLoader is the most complete, and the other three lie somewhere in between.

FREELoader

FreeLoader 1.0 costs nothing because advertisers pay for the chance to hawk their wares while you use it. FreeLoader copies individual pages and entire sites to

your disk on command or based on a schedule. It lets you view the sites in Netscape Navigator but not in other browsers.

The price you pay for this convenience is that once a day—whether you want it or not—the program downloads and displays a page of news, links, and advertisements from FreeLoader Inc.'s Web site. You can download any of FreeLoader's preselected sites or select your own, but you must use the program's 14 built-in categories. The next version will let you create categories of your own.

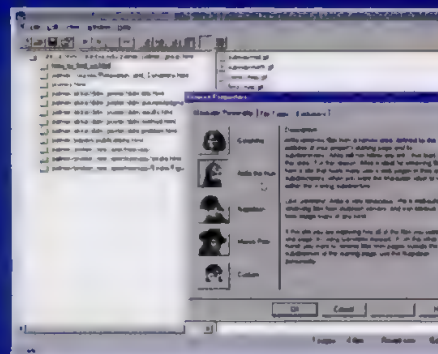
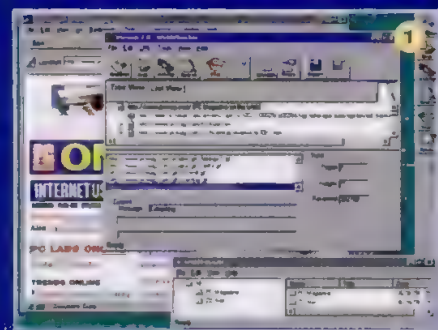
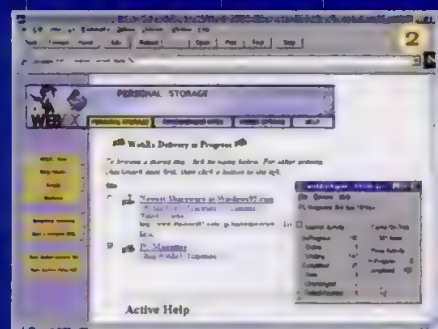
Downloaded pages are stored in FreeLoader's disk cache and can only be saved to other directories by opening and saving each page in Navigator. The program uses DDE to communicate with the browser, but an option to set FreeLoader up to work as a proxy server is due.

Compared with its rivals, FreeLoader is easy to use, and the price is right, but those relentless ads get old. **FreeLoader 1.0.** List price: Free. Requires: 8MB RAM, 4MB hard disk space, Microsoft Windows 3.x or later, Netscape Navigator 1.1 or later. FreeLoader Inc., Washington, DC; 202-686-0660; fax, 202-686-0685; <http://www.freeloader.net>. Circle 431 on reader service card.

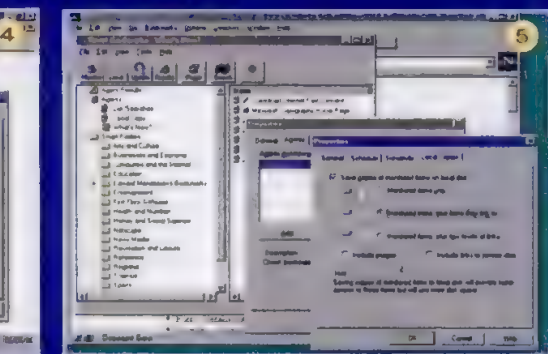
INTERNET MARAUDER

Unlike most off-line readers, Bourbon Street Software's \$10

Five Ways to Browse



WEB WINDOWS: 1 WebWhacker is a complete environment for managing downloaded sites, with a floating toolbar and the Explorer-like WebManager window. 2 The WebEx interface resides inside your browser making browsing off-line as easy as it is online. A separate Agent window displays the status of downloads. 3 FreeLoader costs the user nothing because it visits the company's Web site once a day to download links, news, and advertising. 4 Internet Marauder is an off-line browser with personality. Four built-in profiles allow you to vary the depth and scope of searches, or you can make your own search filters. 5 Smart Bookmarks' efficient interface offers a well-chosen set of options for downloading and checking Web sites, but you should look elsewhere for complex customization options.



browse through it even when you're not connected to the Net. After downloading all or part of a Web site, you can browse the local copy of the site at hard disk speed at your leisure. This new class of software not only makes the Web

start and specify whether to capture linked pages and graphics. Option settings let you save linked pages one or more levels away from the starting page and let you decide whether the programs should pursue links out-

and powerful off-line readers. Comparable programs that you can find on the Internet include Metz Software's Metz Netriever (<http://www.metz.com>), Tympani Development's NetAttaché (<http://www.tympani.com>), and

First Looks

Internet Marauder 1.4 downloads only the specific file types that you select. When you only want a list of the files linked to a particular page or site without downloading the content, Internet Marauder can do that too.

The program lets you limit a search to links from a single page, on a single domain, or to one level outside the domain of the starting page. When you launch Internet Marauder, a wizard lets you set search options. The program includes four built-in search robots—Attila the Hun, Geronimo, Marco Polo, and Napoleon—which explore pages at varying distances from the starting page. You can also create a filter based on the built-in list of file types or produce your own. If you choose to create a custom-search robot, you can decide whether to download or ignore image maps, or even ignore embedded graphics altogether.

Internet Marauder's main window looks like the Windows Explorer interface. The right panel displays a list of remote files as they are downloaded to your disk, while the left panel displays a directory of the Web pages linked to the starting page. The current version does not allow you to alter the file list, but a future version will be configurable.

Internet Marauder won't set any speed records, but it's well suited to conducting unattended searches. Internet Marauder Pro, a faster, multithreaded \$30 version with support for password-restricted Web sites and the ability to limit downloads by file size, should be ready soon.

Neither version includes scheduling, but both help you find what you're looking for and then get out of the way.

Internet Marauder 1.4. List price: \$10. Requires: 8MB RAM, 1MB hard disk space, Microsoft Windows 95 or Windows NT. Bourbon Street Software, New Orleans, LA; fax, 504-866-2937; <http://wymple.gs.net/~bourbon/index.htm>. *Circle 432 on reader service card.*

SMART BOOKMARKS

FirstFloor's \$25 Smart Bookmarks 2.0 was designed primarily to alert you to changes in Web pages, but you can also use it as a bare-bones off-line browser. The program, available either through FirstFloor or as a part of Netscape's \$49.95 PowerPack, lets you choose simply to be notified of changes in remote sites or to have these modified pages downloaded for later viewing. In addition to performing these tasks on command, the program lets you schedule updates or downloads at regular intervals.

You'll need your browser to view downloaded pages, but Smart Bookmarks can do its work without the browser running. All pages are stored in Smart Bookmarks' disk cache, and you save them elsewhere on your disk by opening them in your browser and saving each file by hand.

The unobtrusive interface consists of an Explorer-style window with a directory of folders on the left and the names of individual sites on the right. When you click on a site, your browser is automatically launched and the page opened.

Smart Bookmarks is small and unobtrusive, and it may be the reader you use most often.

Smart Bookmarks 2.0. List price: \$25. Requires Windows 3.1 or later, any standard browser. FirstFloor, Mountain View, CA; 800-639-6387; fax, 415-968-1193; <http://www.firstfloor.com>. *Circle 433 on reader service card.*

WEBEX

Traveling Software's \$29.95 WebEx is an efficient off-line reader and the only program of its kind that works almost entirely inside your browser. Although this approach reduces interface overload, the non-standard menu structure and toolbars that WebEx inserts in the familiar browser window take some getting used to.

When you see something you want, click a button on the WebEx toolbar. An options page appears in which you specify the depth of the search and the types

of elements to save (text, graphics, or multimedia files). You can also choose whether to cache the pages immediately or schedule an unattended download.

Launch WebEx and an Agent window appears on your screen and tells you whether any downloads are scheduled. From this window you can launch either Internet Explorer or Navigator, which automatically configure the Agent as a proxy server. Be warned that if you launch FirstFloor's Smart Bookmarks while using WebEx, Smart Bookmarks adapts itself to the new proxy-server setting and won't work when you try to run it again—unless WebEx is also running.

WebEx's HTML-based forms allow you to set preferences for downloading and scheduling, and optionally to limit the download to a specified size, and then check off the sites you want to save. One bonus is that you can use your browser—albeit slowly—while WebEx downloads in the background. When you select a downloaded site to view, WebEx generates a table of contents that lists either all pages on the site or only those unread.

Unfortunately, WebEx won't work unless you have graphics turned on in your browser—a real inconvenience for dial-up users. And you can't tell the program where to store a Web site; the program stores all pages under arbitrary names in its own directory. But if you can live with these glitches, you'll find WebEx a fast, reliable, and effective Web surfing companion.

WebEx. List price: \$29.95. Requires: 12MB RAM, 10MB hard disk space, Microsoft Windows 95. Traveling Software, Bothell WA; 800-343-8080, 206-483-4088; <http://www.travsoft.com>. *Circle 434 on reader service card.*

WEBWHACKER

WebWhacker 2.0 is more than a off-line reader—it's an environ-

ment, complete with toolbars, search tools, and utilities for finding and downloading pages.

The \$49.95 package from the ForeFront Group places WebWhacker's toolbar at the edge of your screen. You then launch your browser, and when you find a site you want to save, click on the Grab button. WebWhacker's Subscription Wizard pops up with the page's URL already filled in. A window in the Wizard displays the WebManager catalog—a directory of saved sites—and you can select where to store new ones.

A succession of dialog boxes allow you to specify how many levels you want to retrieve and to schedule periodic updates. WebWhacker's main window then opens, and you click on the Start button to begin downloading. A status window displays the progress of the download, and as the pages are copied to your disk their addresses are added to a tree diagram in a second window.

When you want to read a page, you click on its address in the directory and its contents appear in your browser window. Pages are stored in a single file that only WebWhacker can read, but an Export button lets you save sites or pages to the directory of your choice.

We had to change the proxy-server settings by hand, but the ForeFront Group promises that an update will automatically configure these settings, so your browser will work nor-

mally if you run it without WebWhacker. With its impressive search and organization features, WebWhacker is one of the best ways to get the most out of Web sessions.

WebWhacker 2.0. List price: \$49.95. Requires: 4MB RAM, 1MB hard disk space, Microsoft Windows 95 or Windows NT. ForeFront Group, Houston, TX; 800-867-1101, 713-961-1101; <http://www.ffg.com>. *Circle 435 on reader service card.*

FIRST LOOKS PLUS

From Sept. 2 to Sept. 6, go online to discuss Off-line Readers with Contributing Editor Edward Mendelson. Type GO EDITOR on CompuServe to join the discussion.

STATISTICA

STATISTICA (automatically configures itself for Windows 95 or 3.1) ■ A complete data analysis system with thousands of on-screen customizable, presentation-quality graphs fully integrated with all procedures ■ Comprehensive Windows support, OLE (client and server), DDE, customizable *Auto Task* toolbars, pop-up menus ■ Multiple data-, results-, and graph-windows with *data-graph* links ■ The largest selection of statistics and graphs in a single system; comprehensive implementations of: Exploratory techniques with advanced brushing; multi-way tables with banners (presentation-quality reports); nonparametrics; distribution fitting; multiple regression; general nonlinear estimation; stepwise logit/probit; general ANCOVA/MANOVA; stepwise discriminant analysis; log-linear analysis; confirmatory/exploratory factor analysis; cluster analysis; multidimensional scaling; canonical correlation; item analysis/reliability; correspondence analysis; survival analysis; a large selection of time series modeling/forecasting techniques; structural equation modeling with *Monte Carlo* simulations; and much more ■ On-line *Electronic Manual* with comprehensive introductions to each procedure and examples ■ Hypertext-based *Stats Advisor* expert system ■ Workbooks with multiple *AutoOpen* documents (e.g., graphs, reports) ■ Extensive data management facilities (fast spreadsheet of unlimited capacity with long formulas, *Drag-and-Drop*, *AutoFill*, *AutoRecalculate*, split-screen/variable-speed scrolling, advanced Clipboard support, DDE links, hot links to graphs, relational merge, data verification/cleaning) ■ Powerful *STATISTICA BASIC* language (professional development environment) with matrix operations, full graphics support, and interface to external programs (*DLLs*) ■ Batch command language and editable macros, flexible "turn-key" and automation options, custom-designed procedures can be added to floating *Auto Task* toolbars ■ All output displayed in *Scrollsheets*™ (dynamic, customizable, presentation-quality tables with instant 2D, 3D, and multiple graphs) or word processor-style report editor (of unlimited capacity) that combines text and graphs ■ Extremely large analysis designs (e.g., correlation matrices up to 32,000x32,000, unlimited ANOVA designs) ■ Megabyte Manager with up to 32,000 variables (8 Mb) per record ■ Unlimited size of files; extended ("quadruple") precision; unmatched speed ■ Exchanges data and graphs with other applications via DDE, OLE, or an extensive selection of file import/export facilities (incl. *ODBC* access to virtually all data bases and mainframe files) ■ Hundreds of types of graphs, incl. categorized multiple 2D and 3D graphs, ternary 2D/3D graphs, matrix plots, icons, and unique multivariate (e.g., 4D) graphs ■ Facilities to custom-design new graph types and add them permanently to menus or toolbars ■ On-screen graph customization with advanced drawing tools (e.g., scrolling and editing of complex objects in 32x real zoom mode), compound (nested) OLE documents, *Multiple-Graph AutoLayout Wizard*, templates, special effects, icons, page layout control for slides and printouts; unmatched speed of graph redraw ■ Interactive rotation, perspective and cross-sections of 3D displays ■ Large selection of tools for graphical exploration of data: extensive brushing tools with animation, fitting, smoothing, overlaying, spectral planes, projections, layered compressions, marked subsets ■ Price **\$995**.

Quick STATISTICA (for Windows) ■ A subset of *STATISTICA*; comprehensive selection of basic statistics and the full analytic and presentation-quality graphics capabilities of *STATISTICA* ■ Price **\$495**.

STATISTICA/QC - Industrial statistics add-on package (requires *STATISTICA* or *Quick STATISTICA* for Windows) ■ The largest selection of industrial statistics in a single package; quality control charts (compatible with real-time data acquisition systems), process capability analysis, R&R, sampling plans, and an extremely comprehensive selection of experimental design (DOE) methods ■ Flexible tools to customize and automate all analyses and reports (incl. "turn-key" system options, and tools to add custom procedures) ■ Price **\$495**.

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Man's footprint, the moon

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WEB AUTHORIZING

Web.Graphics Suite: The Internet Page Design Shop

By John Morris

The \$219 Corel Web.Graphics Suite is a collection of tools consisting of both Corel products, such as drawing and animation tools and a clip-art collection, and software licensed from third parties for editing Web pages, converting text to HTML, and designing 3-D environments. Together, these tools provide the Webmaster wannabe with everything needed to create pages with presence, although integration of the elements is not the program's strong suit.

The suite's main module is Web.Designer, a WYSIWYG HTML editor nearly identical in appearance to Macromedia's \$99 Backstage Designer Plus. Both companies licensed the application from iband, which is now owned by Macromedia.

The first thing you'll notice about Web.Designer's interface is that it looks like a word processor. When you launch Web.Designer, the program asks whether you want to start a new page, open an existing Web page, or use one of the 100 templates, ranging from common documents (résumés and newsletters) to theme-based pages (food, travel, and wildlife).

You enter and format text pretty much the same way you would in any word processor. You can also view and edit the HTML source code. Web.Designer provides all the text formatting options you're likely to need in an uncluttered interface. Toolbar buttons allows you to edit the HTML tags, view the Document Tree (an outline of the elements), create hyperlinks, and insert images and horizontal rules.

While Web.Designer's text editing features are impressive, it's handling of graphics really stood out. The Image Properties dialog box allows you to resize graphics, specify their alignment, apply borders, enter alternate text for browsers that don't dis-

play graphics, and create and edit image maps. A Page Properties dialog box lets you specify a background image, as well as the

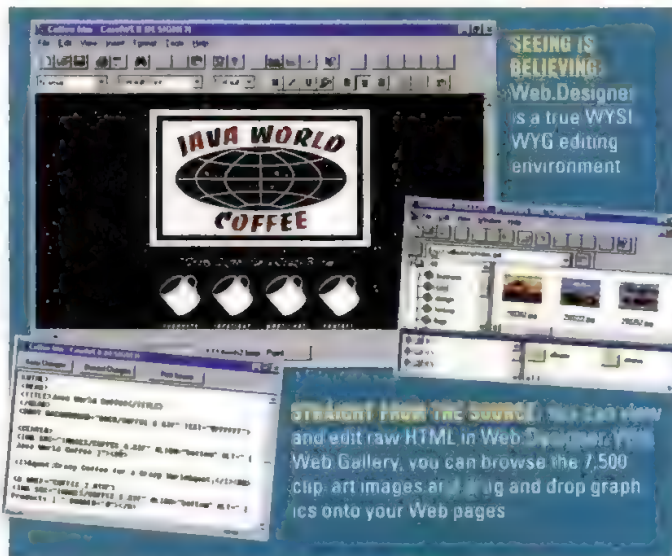
includes Web.Draw, a vector-based drawing tool.

The program includes a licensed version of InfoAccess's HTML Transit, which converts Microsoft Word, WordPerfect, and .RTF files into HTML. And it automatically converts most graphics formats into either .GIF or JPEG formats in their original size or as thumbnails

HTML and slightly more than a minute to translate a similar document with five graphics. Web.Transit preserved most of the basic formatting, but it failed to translate underlining, different font types, and some paragraph formatting such as indentation.

When you're ready to go beyond static pages, Web.Graphics Suite offers two tools that allow you to create animation and build 3-D environments. With Web.Move, you can convert a series of bitmap images into a short sequence, complete with props and sound. Web.World, which Corel licensed from ParaGraph, allows you to design VRML worlds.

Web.Graphics Suite offers little help when it comes to actually publishing to the Web; the program focuses strictly on authoring. But most users will find that the suite provides all the tools they need to put together colorful and sophisticated-looking Web pages. **Corel Web.Graphics Suite.** Estimated street price: \$219. Requires: 8MB RAM, 60MB hard disk space, Microsoft Windows 3.x, Windows 95, or Windows NT. Corel Corp., Ottawa, Ontario, Canada; 800-772-6735, 613-728-3733; <http://www.corel.com>. Circle 436 on reader service card.



colors for text and links. You can insert graphics manually or drag and drop them from an included collection of more than 7,500 items with the Web.Gallery tool. Web.Graphics Suite also

with links to the full-size images.

On our tests, Web.Transit converted documents to HTML quickly and accurately. It took 15 seconds to convert a ten-page plain-text Word document to

ONLINE SERVICES

AOL's Third-Generation Client Improves on a Good Thing

By Amarendra Singh

In our recent roundup of online services, ("Adapting to the Web," June 11, 1996), America Online garnered an Editors' Choice award for its combination of strong content and an intuitive interface. AOL's new client, America Online 3.0, builds on these strengths with an even cleaner design and a number of enhancements that augment the service's content.

The first and most obvious is the addition of several new channels, including Digital City, Games, Health and Fitness, The Hub, International, Music Space,



NEW LOOK: AOL's client features a redesigned interface and expanded content, including seven new channels.

and Style. Digital City is a regional information service, and The Hub is an attempt at a pop e-zine.

Both these channels are already well populated with content.

AOL has unified a variety of customized options into a single area called "My AOL." Here users can run through various

options for customizing the AOL setup. Although some of the design changes seem subtle, the extensive use of 3-D graphics serves to make the service a little more pleasant to use.

AOL has also made an effort to address some of the primary complaints about the service—particularly criticism about the

speed of the network and the time required to download art. AOL now supports progressive



SIoux CITY



Something **For** Everyone!

Nothing like a shimmering glass of ice water to conquer a powerful thirst. Since the Dust Bowl of the 1930s, the uniquely American Wall Drug in western South Dakota has offered free ice water to parched travelers. Today restaurants around the world reflect Wall Drug's basic customer service standard.



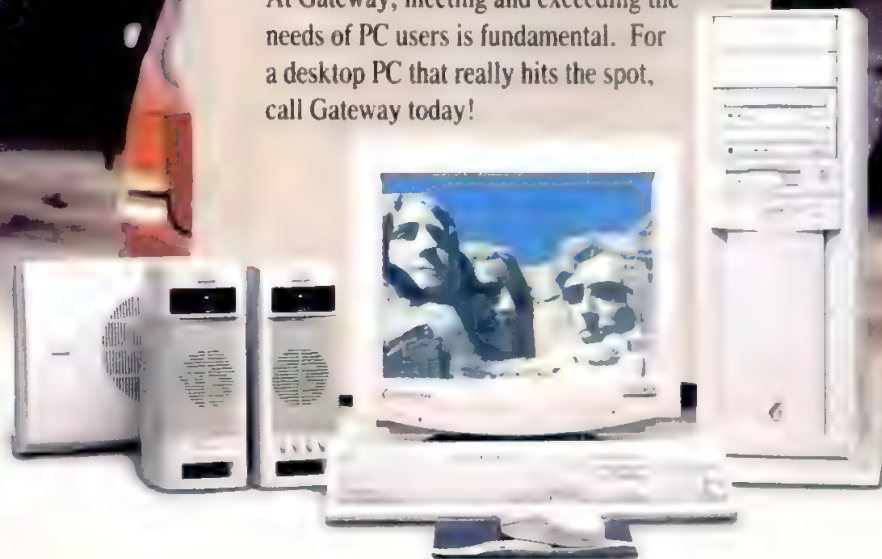
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Ahhh! There's nothing like quenching your thirst for power and creativity with one stellar PC. That's why we took the fastest Pentium® processor available and combined it with refreshing new technology like a CD-recordable drive and 32MB synchronous DRAM to produce our new P5-200XL. You get lightning-fast performance, plus all the tools you need to create your own CDs. At Gateway, meeting and exceeding the needs of PC users is fundamental. For a desktop PC that really hits the spot, call Gateway today!



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Each summer road warriors from every imaginable background throw a leg over their rumbling hogs and head for Sturgis, South Dakota. Since 1938, this small town has been the site of a huge, week-long motorcycle rally attracting free spirits from around the globe who want to explore their wild side. Bushy beards and colorful body art mingle freely with designer leather and fine jewelry. The common bond? Open road, man, open road.



Gateway Solo 2100 Portable PCs

Relax. The freedom of the new Gateway Solo™ 2100 multimedia notebook is yours. Based on the road-tested features of the Gateway Solo portable PC, Solo 2100 notebooks deliver all the features you want *and* need. Bigger screens, an all Pentium® processor-based lineup, 6X CD-ROM drives and 16MB EDO RAM standard — for less. They start at \$2,699. And because we know you're accustomed to free rein, all Gateway Solo 2100 multimedia notebooks are custom-built to your specifications. We've blazed new trails in portable computing — now you can too. Road warriors, call Gateway today!



"You've got a friend in the business."®

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More
BIG
Trends from
Gateway!



February 1988

The bovine species makes its debut in PC advertisements with Gateway's first national ad. Cows become cool.



July 1990

The stakes are raised in PC advertising. Gateway pioneers theme ads and easy-to-read bullet-point configurations with the "PC Saloon" ad.



April 1991

Gateway starts shipping PCs in cow-spotted boxes. Cow-spot fever spreads across the nation.



February 1992

PCs with the "works" become the standard, as Gateway offers choice of application software on new systems at no extra charge.

Quality That's **EASY** To Spot!

Gateway 2000 has been taking the guesswork out of buying PCs ever since our humble beginning in 1985. We give you all the information you need to find the right system. And great prices, quality products and outstanding service and support are the norm rather than the exception. We've also made your PC buying experience more fun by embracing our origins — Gateway was started by a couple farm boys in a barn on a Midwestern cattle ranch. In honor of these roots, 5,000 GATEWAY™ employees painted cow spots on our headquarters. No polished silver or mirrored glass here. That's not Gateway's style. After all, we *were* born in a barn.

Destination Big Screen PC

It's easy to spot the big trends with Gateway. Now after 11 years of rolling out some of the hottest trends around, we started a trend that will change the way you look at computers — forever. It's the Destination™ Big Screen PC. We've merged the features of a multimedia PC with the impact of a big screen TV to create a whole new computer category. The 31-inch monitor, wireless keyboard and Field Mouse™ remote control harness the power of a Pentium® processor to give you the ultimate multimedia PC. Computing just moved to the family room. Pull up a couch. For the big picture, call Gateway today!



July 1994

The multimedia bonanza begins — CD-ROM drives become standard on all Gateway desktop systems.



pentium



GATEWAY2000

"You've got a friend in the business."

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Multimedia Systems

P5-120 FAMILY PC™

- Intel® 120MHz Pentium® Processor
- 16MB EDO DRAM
- 850MB 10ms EIDE Hard Drive
- 1MB DRAM, 64-Bit PCI Graphics
- 8X CD-ROM Drive/3.5" Diskette Drive
- 16-Bit GATEWAY™ Sound Card
- Altec™ Lansing ACS-40 Speakers
- TelePath® 28.8 Fax/Modem
- CrystalScan® 15" .28dp Monitor (13.9" viewable)
- 7-Bay Mini Tower Case
- 104+ Keyboard & MS Mouse 2.0
- Microsoft® Windows® 95
- Generations II Software Collection

\$1799

P5-166 FAMILY PC

- Intel 166MHz Pentium Processor
- 16MB EDO DRAM
- 256K Pipelined Burst Cache
- 2.5GB 11ms EIDE Hard Drive
- 2MB DRAM, 64-Bit PCI Graphics
- 8X CD-ROM Drive/3.5" Diskette Drive
- 16-Bit Gateway Sound Card
- Altec Lansing ACS-40 Speakers
- TelePath 28.8 Fax/Modem
- Vivitron™ 17" .26dp Monitor (15.9" viewable)
- 12-Bay Tower Case
- 104+ Keyboard & MS Mouse 2.0
- MS Windows 95
- Generations II Software Collection

\$2699

P5-200XL

- Intel 200MHz Pentium Processor
- ▶ **32MB Synchronous DRAM**
- 512K Pipelined Burst Cache
- 2.5GB 11ms EIDE Hard Drive
- Matrox® 2MB WRAM PCI Graphics
- ▶ **CD-Recordable w/ SCSI Controller**
- 8X CD-ROM Drive/3.5" Diskette Drive
- 16-Bit Gateway Sound Card
- Altec ACS-400 ACS 250 Speakers
- TelePath 28.8 Fax/Modem
- Vivitron 17" .26dp Monitor (15.9" viewable)
- 12-Bay Tower Case
- 104+ Keyboard & MS Mouse 2.0
- MS Windows 95
- MS Office 95, Professional Edition*
- Generations II Software Collection
- Gateway Gold™ Premium Service

\$3999

DESTINATION™ SYSTEMS

- All systems match corresponding multimedia system configurations listed, excluding speakers, with Destination Big Screen PC upgrade (see details on next page) replacing standard corresponding components and software.

■ D5-120 **\$3499**

■ D5-166 **\$3999**

■ D5-200 **\$5099**

Professional Systems

P5-100

- Intel 100MHz Pentium Processor
- 16MB EDO DRAM
- 850MB 10ms EIDE Hard Drive
- 1MB DRAM, 64-Bit PCI Graphics
- 8X CD-ROM/3.5" Diskette Drives
- Vivitron 15" .26dp Monitor (13.9" viewable)
- 7-Bay Mini Tower Case
- 104+ Keyboard & MS Mouse 2.0
- MS Windows 95
- MS Office 95, Professional Edition*

\$1599 Business Lease* \$59/mo.

P5-133

- Intel 133MHz Pentium Processor
- 16MB EDO DRAM
- 256K Pipelined Burst Cache
- 1.6GB 9ms EIDE Hard Drive
- 2MB MDRAM, 128-Bit PCI Graphics
- 8X CD-ROM/3.5" Diskette Drives
- Vivitron 15" .26dp Monitor (13.9" viewable)
- 7-Bay Mini Tower Case
- 104+ Keyboard & MS Mouse 2.0
- MS Windows 95
- MS Office 95, Professional Edition*

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P5-166

- Intel 166MHz Pentium Processor
- ▶ **32MB Synchronous DRAM**
- 256K Pipelined Burst Cache
- 2.5GB 11ms EIDE Hard Drive
- 2MB MDRAM, 128-Bit PCI Graphics
- 8X CD-ROM/3.5" Diskette Drives
- Vivitron 17" .26dp Monitor (15.9" viewable)
- 12-Bay Tower Case
- 104+ Keyboard & MS Mouse 2.0
- MS Windows 95
- MS Office 95, Professional Edition*

\$2699 Business Lease* \$99/mo.

G6-180

- Intel 180MHz Pentium Pro Processor
- 16MB EDO DRAM
- 2.5GB 11ms EIDE Hard Drive
- 2MB MDRAM, 128-Bit Graphics
- 8X CD-ROM/3.5" Diskette Drives
- Vivitron 15" .26dp Monitor (13.9" viewable)
- 12-Bay Tower Case
- 104+ Keyboard & MS Mouse 2.0
- MS Windows NT® Workstation 3.51 or MS Windows 95
- MS Office 95, Professional Edition*

\$2499 Business Lease* \$92/mo.

Professional Systems

G6-200

- Intel 200MHz Pentium Pro Processor
- 32MB EDO DRAM
- 2GB 9ms Fast SCSI Hard Drive
- Matrox 4MB WRAM PCI Graphics
- 4X SCSI CD-ROM Drive
- 3.5" Diskette Drive
- Vivitron 17" .26dp Monitor (15.9" viewable)
- 12-Bay Tower Case
- 104+ Keyboard & MS Mouse 2.0
- MS Windows NT Workstation 3.51 or MS Windows 95
- MS Office 95, Professional Edition*

\$3699 Business Lease* \$136/mo.

The D5-200 PC has not been approved by the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or leased until the approval of the FCC has been obtained.

Gateway Solo™ 2100 Portable PCs

S5-100

- 11.3" DSTN SVGA Color Display
- Intel 100MHz Pentium Processor
- 16MB EDO DRAM expandable to 40MB
- 256K Pipelined Burst Cache
- 1MB EDO Video RAM
- 540MB Hard Drive
- Modular 6X CD-ROM Drive
- Modular 3.5" Diskette Drive
- 16-Bit Sound & Stereo Speakers
- Lithium Ion Battery & AC Pack
- 85-Key MS Windows 95 Keyboard
- Carrying Case
- MS Windows 95
- MS Works 95

\$2699 Business Lease* \$99/mo.

S5-133

- 12.1" Active Matrix SVGA Color Display
- Intel 133MHz Pentium Processor
- 40MB EDO DRAM
- 256K Pipelined Burst Cache
- 1MB EDO Video RAM
- 1.2GB Hard Drive
- Modular 6X CD-ROM Drive
- Modular 3.5" Diskette Drive
- 16-Bit Sound & Stereo Speakers
- 28.8 PCMCIA Fax/Modem
- 2 Lithium Ion Batteries & AC Pack
- 85-Key MS Windows 95 Keyboard
- Carrying Case
- MS Windows 95
- MS Office 95, Professional Edition*

\$5449 Business Lease* \$195/mo.



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Destination™ BIG SCREEN PCs

In the market for a multimedia PC? Consider upgrading to a Big Screen PC. Just like all our computers, the Destination Big Screen PC is built to order, with your choice of Pentium processor, DRAM, hard drive, CD-ROM drive, diskette drive, and fax/modem.

The following Destination components replace the corresponding standard components of the Family PC and XL systems:

- **Video Card:** STB® 2MB VRAM Graphics Accelerator w/ Cable-Ready TV Tuner
- **Sound Card:** 16-Bit Hi-Fi Wavetable Audio Card
- **Monitor:** Destination 31" VGA Monitor
- **Case:** 7-Bay Charcoal-Colored PC Case
- **Keyboard:** Wireless Keyboard with Integrated EZ Pad™ Pointing Device
- **Mouse:** Field Mouse™ Remote with Integrated Trackball
- **Software:** Destination Software Collection

(Call about this package of software specially selected for the Destination Big Screen PC's extraordinary multimedia capabilities.)

- **Speakers:** Not included. The Destination Big Screen PC has been designed for easy integration with your existing stereo system. Need a high-quality sound system?

See speaker option at right.

Trend-Setting EXTRAS!

Multimedia/Communication

- **CD-Recordable \$599**

NEW! 4X read/2X write recordable CD drive with SCSI controller, Corel® CD Creator 2 for MS Windows® 95 and three media disks.

- **Altec™ Lansing ACS-250 Subwoofer \$75**
(upgrade from PCs that include Altec ACS-40 speakers)
- **Altec ACS-400 Speaker System w/ACS-250 Subwoofer \$120**
(upgrade from PCs that include Altec ACS-40 speakers)

Networking

3Com® Ethernet Adapters

- 16-Bit Triple Media Card with BNC, AUI and RJ-45 Connectors \$99
- 16-Bit Card with only RJ-45 Connector \$79

Printers and Scanners

- **Epson® Stylus™ Color IIs Ink Jet Printer \$169** after \$30 mfr. rebate
- **Hewlett®-Packard DeskJet 600C Ink Jet Printer \$209**
- **Epson Stylus Color II Ink Jet Printer \$249** after \$30 mfr. rebate
- **Hewlett-Packard LaserJet 5L Printer \$479**
- **Hewlett-Packard LaserJet 5P Printer \$849**
- **Epson Action Scanning™ System II \$449**

Service & Support

Gateway Gold™ Premium

- **Extended Three-Year On-Site Agreement* for Desktop Systems**
- **Priority 800 Number For Access to Technical Experts**
With system purchase \$99
Within current on-site service agreement \$129

Ask about Gateway Gold Premium upgrade for the Destination Big Screen PC.

*On-site service for desktop and tower systems is available to most U.S. and Canadian locations after determination by a Gateway tech that you need it. On-site service is provided by PC Technology Services, Inc. Write or call for a free copy of the on-site service agreement.



Option

- **harman/kardon High-Fidelity Sound System**

Seven-piece Dolby® Surround Sound Pro Logic speaker system including AVR-10 audio/video receiver with remote, subwoofer, center channel, and four satellites for the ultimate multimedia audio experience. **\$699**

Software

- **Kid's BackPack™ III**

Includes School House Rock™: Grammar Rock™; Sesame Street: Get Set to Learn®; Math Blaster 2®: Secret of the Lost City; Imo & The King™; Putt-Putt® Goes To The Moon™; and Gateway cow-spotted backpack. **\$59**

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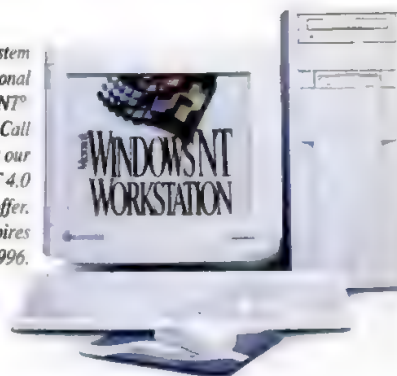
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Can you spot the 7 ways to catch a virus?

Sales rep picks up notebook computer from MIS department.

Goes to airport.

Flight cancelled. Downloads stock market news from the Internet.

Accesses email.

Catches plane.

Copies game from fellow passenger.

Opens attached document on email from research assistant.

Arrives at regional sales office and loads demo disk for presentation.

Accesses online service for up-to-the-minute industry projections.

Borrows floppy from hotel business office to print presentation.

Arrives at client and begins presentation.

That dreaded message appears: "Application error. Program file corrupted."

Blurts expletive.

This sales rep encountered 7 computer viruses in just one trip. Think of all the times you run into similar situations in the office, on the road, or even at home with the floppies your kids are borrowing. Yikes.

PROBLEMS:

1. You can catch a virus by using someone else's computer.
2. You can catch viruses off the Internet.
3. Floppies are petri dishes for viruses. If you share games or applications, you could be sharing viruses.
4. Anytime you open an attached email document, you can catch a virus.
5. If you share software, whether it's from a friend or someone at the office, you can get a virus.
6. Even though most online services scan their content for viruses, some viruses slip by and don't show up until the worst possible moment. Then, it's too late. You're infected.
7. Hotel business centers can be breeding grounds for viruses.

SOLUTION:

Norton AntiVirus® protects against the very real threat of computer viruses by automatically detecting and eliminating viruses before they corrupt your system. Installed in minutes, it's the most popular anti-virus program, used by 94% of the Fortune 100 companies.

To purchase Norton AntiVirus, visit your local software reseller or for even more info, call 1-800-822-6417 ext. 9191.

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Available for Windows and Macintosh. (SAM® for Macintosh virus protection.)

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Protect your friends.**



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CIRCLE 079 ON READER SERVICE CARD

image rendering: You no longer have to download all the images before viewing a new area; frames and text download first, and images gradually fill in. This is similar to the interlaced .GIF files used extensively on the World Wide Web.

AOL's connectivity options are unchanged. The service is available at speeds of up to 28.8 Kbps using AOLnet, BBN, SprintNET, or AOL's toll-free number. If you already have an Internet connection, you can access the service over the Net itself. And if you're lucky enough to have a high-speed connection, the service will seem as if it's running from a file server just down the hall.

The Web browser now supports HTML 3.0, as well as many of Netscape's proposed HTML extensions. Eventually, AOL will offer Microsoft's Internet Explorer as its default browser, but until then, you can view most Web pages accurately as long as they don't contain Java applets or require plug-ins. The current version of the browser does support Secure Socket Layer, so you can execute transactions on the Web. AOL also provides a nice FTP client, an excellent newsreader, and a Gopher browser. You can also use any Winsock-compliant software if you download AOL's Winsock.

In addition to its polished interface, AOL is known for the quality and breadth of its content. With this client, AOL offers a better way to sift through all this material. At the rate it's adding content and enhancements to its browser, not to mention the forthcoming integration of Internet Explorer, AOL is making it difficult for aspiring online services to keep up.

America Online 3.0. Basic price: \$9.95 monthly for 5 hours, \$2.95 for each additional hour. Requires: 8MB RAM, 15MB hard disk space, Microsoft Windows 3.1 or Windows 95. America Online Inc., Vienna, VA; 800-827-6364, 703-448-8700; <http://www.aol.com>. **Circle 430 on reader service card.**

WORLD WIDE WEB

Get Real About Internet Sound With RealAudio Version 2.0

By Jan Ozer

Progressive Networks pioneered streaming audio over the Internet, and the company is the undisputed market leader, with over four million players distributed. Real Audio Version 2.0 provides real-time encoding, improved audio quality, and several new features that greatly expand the utility of streaming audio. RealAudio 2.0 is ideal for anyone with a URL and a desire to get their message across loud and clear.

While most competing technologies provide only simple linear audio playback, Progressive has developed a diverse and useful feature set, embodied in three separate components: RealAudio's Encoder, Server, and Player. RealAudio now enables real-time broadcasting, pause, and resume of audio playback, and random access to the audio stream, allowing multiple entry points into a single large file.

New in Version 2.0 is synchronized multimedia—the ability to trigger URL address changes at specified points in the audio stream. A 5-minute presentation of current financial results, for example, could display the balance sheet, income statement, and cash-flow analysis in sync with the audio, allowing kiosk-like display of Web pages. For an example of this technology, check out the *PC Magazine* CD site (<http://www.pcmagcd.com>). Also new in this version is bandwidth negotiation, which customizes data flow based on modem speed, and enhanced firewall support.

The Player is similarly feature-rich; it includes volume control and slider bar, as well as support for Netscape's 2.0 plug-in specification for seamless integration into a Web page; RealAudio also supports Microsoft's ActiveX specification.

We installed the RealAudio Server on a Windows NT server hosting a 15-workstation, 10-Mbps Ethernet network and running Microsoft's Internet Information Server. Clients included several Windows 95 Pentium desktop computers.

All in all, installation was simple if a touch finicky, requiring some minor troubleshooting and tinkering with the server configuration file. Nonetheless, we loaded the Server, Encoder, and several players and were broadcasting in real time in under two hours. Once running, the Server and Live Transfer Agents both worked flawlessly.

The simple and intuitive RealAudio Encoder largely

slightest traces of slurring—a substantial improvement over Version 1.0. Music quality of files encoded and played at 14.4 Kbps was degraded but improved substantially at 28.8 Kbps, becoming quite usable.

We tested live encoding with a Electro Voice N/D 257 microphone powered by a Phonic MM122 equalizer, which together cost under \$450. We encoded on a Gateway Pentium/90 PC with a Sound Blaster 16 sound card and broadcast the stream over an intranet at 28.8 Kbps to five clients equipped with inexpensive speakers. Audio quality was again quite good and, on most computers it was difficult to detect that the audio had been compressed.

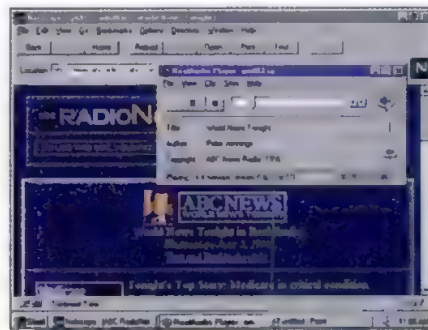
In addition to supporting Windows NT on both Digital Alpha and Intel x86 platforms, the RealAudio Server supports 12 Unix derivatives. Internet pricing ranges from \$495 for five simultaneous streams to \$8,495

for 100. Intranet prices also start at \$495 and depends on the number of licensed players.

The RealAudio Encoder is free and runs on Macintosh, Windows 95, and Windows NT platforms. The Player, available for Windows 3.11, Windows 95, Windows NT, Macintosh, and Unix platforms, can be downloaded free from Progressive's Web site or purchased with the Player on a CD-ROM for \$29.

When sound is the key to your Web site, RealAudio delivers.

RealAudio Version 2.0. List Price: Encoder and Player, free; Server, \$495. Requires: Player, 8MB RAM, 2MB hard disk space, sound card, Internet connection; Server, 16MB RAM, 2MB hard disk space, Internet connection, Microsoft Windows 3.11, Windows 95, or Windows NT. Progressive Networks, Seattle, WA; 800-230-5975, 206-447-0567; <http://www.realaudio.com>. **Circle 429 on reader service card.**



WEB NEWS: With 4 million players distributed, RealAudio has become the broadcast standard on the Net.

comprises two side-by-side windows: one for the audio source, which can be a live stream or file; the other for the destination, which can be a file, or the RealAudio Server for real-time broadcasting. A simple control toggles between the 14.4- and 28.8-Kbps bandwidths.

We analyzed compressed audio quality with six files including both speech and music captured from CD-ROM and cassette using a Sound Blaster AWE32 connected to Yamaha MSW-10 speakers. Speech files at both 14.4 and 28.8 Kbps were mostly clear, exhibiting only the

DIGITAL PHOTOGRAPHY

Canon PowerShot 600: A Point-and-Shoot Camera with Some Professional Features

By Daniel Grotta and Sally Wiener Grotta

Canon's \$949 PowerShot 600 is a conventional-looking, deceptively simple, point-and-shoot camera that offers an impressive array of technological advances and features unheard of in entry-level filmless cameras.

battery pack; the ability to erase the last frame or all frames conveniently; and a time, date, and data stamp.

HIGH-RES CAMERA

The PowerShot's 570,000-pixel charge couple device target produces 24-bit color images with a

switched to a B/W Text mode, which when combined with the macro setting makes for an excellent handheld gray-scale scanner with a resolution of 300 dots per inch. We were able to capture readable text as small as 10 point and from as close as 4 inches, but the image quality was not good enough for optical character recognition. There's a view frame for shooting business cards that works quite well.

The PowerShot is the first entry-level filmless camera that permits audio annotation. The camera has a built-in microphone and saves the sound messages as .WAV files. You can record a variety of sounds, such as bird calls that go with photos of birds, but the audio quality is often disappointing, and capacity is tightly limited.

In addition to 1MB of built-in flash memory, the PowerShot can accommodate standard ATA-format PC Cards—Type I, II, or III—which can be inserted into any laptop or desktop PC Card drive. Canon offers an optional \$229 4MB flash card and a \$380 170MB hard disk card for the camera. In Fine mode, the flash card can store 18 images, and the hard disk card can hold an impressive 900 images. We enjoyed shooting with the PowerShot and 170MB hard disk card because we weren't constrained by limited image-storage capacity.

Our tests revealed that performance differences between the flash card and the hard disk card

were not significant: Acquisition time was 1.5 seconds for the flash card and 1.75 seconds for the hard disk card. But we recommend the hard disk card, because it costs much less on a per-image basis.

Images may be transferred to your PC by sliding the camera into its interface/charge cradle, which plugs into the PC's parallel port. By contrast, most entry-level filmless cameras plug into the slower serial port. Oddly enough, the camera must be turned off when cradled to operate properly. On average, it took 9.8 seconds to transfer a Fine mode image.

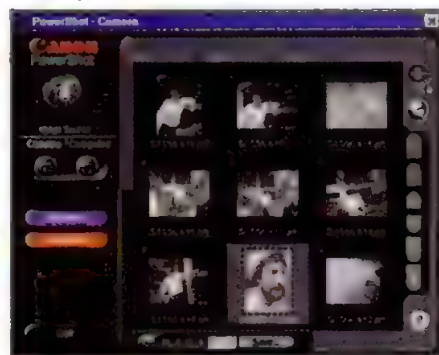
IN FOCUS

Canon boasts that the PowerShot is the only filmless camera under \$10,000 to use a three-zone focus system to obtain sharper, more accurate pictures. Unfortunately, the servo motor and focusing infrared beam take up to a second and a half to focus. This delay made it virtually impossible to get a good snapshot at a sporting event. We were able to reduce the delay time by depressing the shutter halfway to activate the autofocus, but the delay is still far too long for most situations.

To achieve edge-to-edge sharpness, Canon elected to use a fixed focal length lens that can't zoom in on the subject. The company sells a useful and well-designed \$99 auxiliary wide angle lens, however; it slips over the lens and viewfinder, giving the user an accurate view of the widened coverage.

The PowerShot 600's image quality is the best we've seen so far in entry-level cameras, and its features will raise the bar for the competition.

PowerShot 600. List price: \$949. Requires: PC with parallel port. Canon Computer Systems Inc., Costa Mesa, CA; 800-848-4123; <http://www.ccsi.canon.com>. Circle 409 on reader service card.



POINT-AND-SHOOT PLUS: Canon packs impressive features into the PowerShot's deceptively simple case. Switch to B/W Text mode and the camera becomes a 300-dpi handheld gray-scale scanner.



resolution of 832 by 608 pixels—the highest of any digital camera that sells for under \$3,500. There is a trio of user-selectable levels of image compression: Fine, Normal, and Economy. Most users will find the Fine mode suitable for the majority of situations. Each Fine image occupies 150K to 180K in the camera—depending upon the complexity of the subject—and decompresses to a 1.48MB JPEG file. The PowerShot's 7.5-mm, f2.5 lens, which covers a field of view equivalent to a standard 50-mm focal length lens on a 35-mm camera, exhibits better edge-to-edge sharpness than other cameras in its class.

Among the PowerShot's other conventional features are three-stop exposure compensation; a self-timer; automatic white balance; frosted view frames; an interchangeable nickel cadmium



From July 29 to August 2, go online to discuss the Canon PowerShot 600 with reviewers Daniel Grotta and Sally Wiener Grotta and Canon representatives. Type GO EDITOR on CompuServe to join the discussion.

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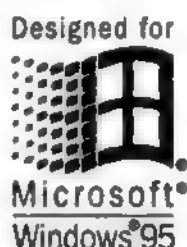
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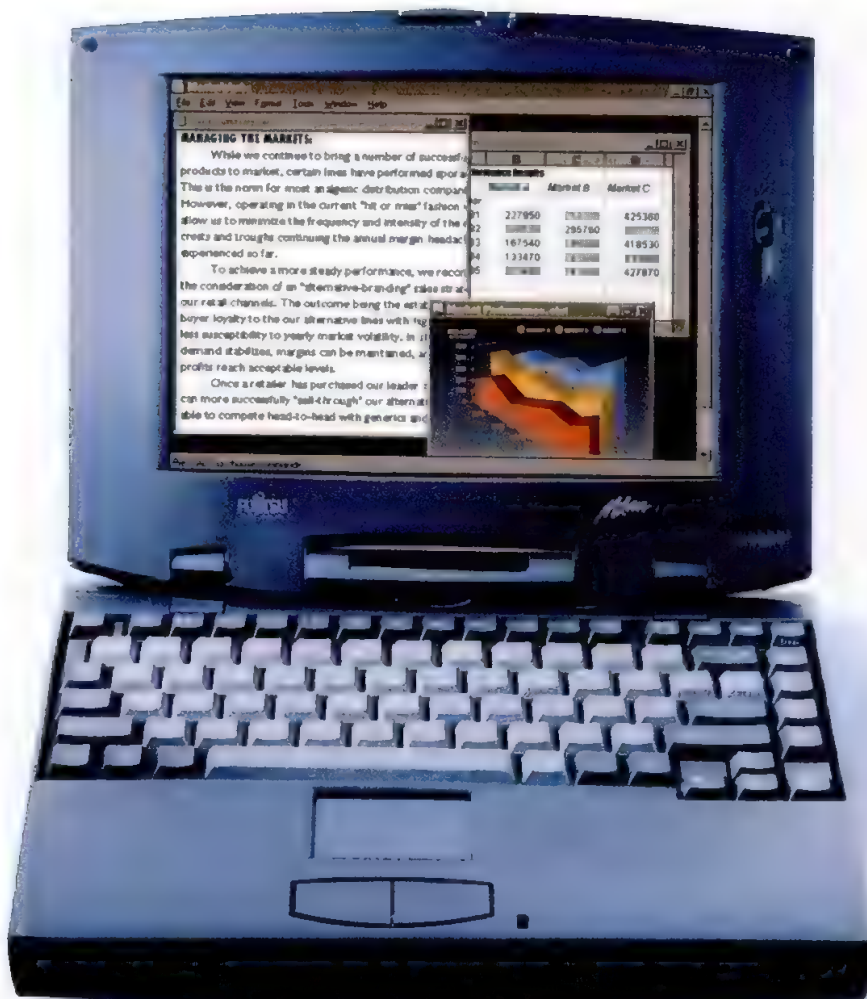
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SPEECH RECOGNITION

Kurzweil Voice Gets Your PC to Listen Up

By David Haskin

The \$695 Kurzweil Voice Release 2.0 shows how far speech recognition has come—and how far it still has to go before it is accepted by the general public. With this program, turning the spoken word into a word processing file and navigating through Microsoft Windows are simpler than ever. Kurzweil Voice gets you up and running quickly, but it's slower than its competition and not yet perfect.

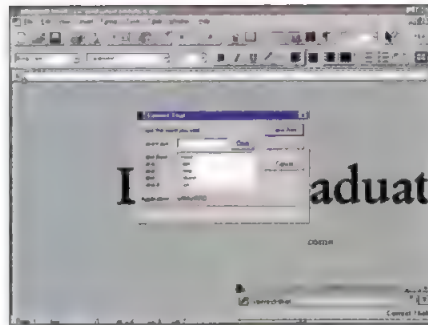
After installing the program with its 30,000 supported words and commands (it also comes with a 60,000-word dictionary), we completed a 30-minute training session during which we dictated about 500 words and numbers so the program could learn the nuances of our voice.

Immediately after this training session, we dictated word processing documents and the program transcribed them with about 90 percent accuracy. This is a level comparable to other speech-recognition products, but it still amounts to about one incorrect word per sentence.

Kurzweil Voice's accuracy improves as you correct recognition errors, and over the course of our evaluation we found that it usually didn't make the same mistake twice. To fix an error, say "correct this," and a window appears that displays words similar to the incorrect one. Select the correct word from the list, type it in, or dictate it using the "alpha, bravo..." alphabet.

To get the most out of Kurzweil Voice, we found that we had to pause for a fraction of a second between words. After 4 hours, we were able to dictate 65 words per minute with accuracy. This is faster than most people type but about 10 words per minute slower than we achieved with DragonDictate (First Looks, May 14, 1996).

In this upgrade, Kurzweil has



HEAR ME: When Kurzweil Voice makes a mistake, you say "correct this" to fix the error.

streamlined Voice's interface by removing unnecessary elements such as a window that listed recently dictated words. Unlike others, Kurzweil Voice doesn't

have separate modes for dictation and controlling applications. Simply speak application commands—"file-save," for example—and the PC obeys. By contrast, DragonDictate requires you to say "command mode" before you can tell your application or Windows what to do.

Kurzweil Voice does a good job of helping users learn and fine-tune the speech-recognition process. A well-thought-out wizard walks you through solving common prob-

lems such as persistent recognition errors. But some users may have difficulty positioning the mouse pointer precisely using voice commands, which makes on-screen navigation comparatively difficult, particularly for the physically handicapped. DragonDictate uses a more accurate on-screen grid system for pointer placement.

Though it may be frustrating when speed is of the essence, Kurzweil Voice is a good choice if you want to dictate and control applications with a minimum of fuss. **Kurzweil Voice Release 2.0.** List price: \$695. Requires: 16MB RAM, 35MB hard disk space, Sound Blaster-compatible sound card, Microsoft Windows 3.1 or Windows 95. Kurzweil Applied Intelligence Inc., Waltham, MA; 800-380-1234, 617-893-5151; <http://www.kurzweil.com>. Circle 405 on reader service card.

ACCESSORIES

Modula Executive Desk Pad: The Flattop of the Desktop World

By Bruce Brown

Source Innovations' \$3,250 Modula Executive Desk Pad is a multimedia control center that eliminates the clutter of the typical PC desk. It replaces the monitor, keyboard, mouse, stereo speakers, and microphone with a single unit that measures 0.5 by 27 by 19 inches (HWD).

At first sight, the silver and black Desk Pad looks like a

shiny blotter; then you notice the thick 6-foot cable that extends from its front right corner. The cable has connectors for the AC adapter, VGA adapter port, audio card, and speaker and microphone jacks. There are also ports for an external keyboard and a mouse. The Desk Pad contains a wireless serial infrared port, but it was not functional.



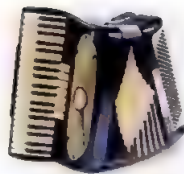
LOW PROFILE: The Modula Executive Desk Pad rises only half an inch above the desk's surface.

The Desk Pad's monitor is a 10.4-inch color active-matrix touch screen that supports 640-by-480 VGA resolution with 256 colors. The screen is in front of the flush keyboard, so you have to reach around and over the screen to get to the keyboard. The keys require a distinct, deliberate touch to be activated, but the touch-screen monitor lets you move the cursor with either your finger or an included stylus.

Small speakers are located in the far corners of the Desk Pad, and there's a tiny microphone in the center. Reproduction of sound—both recording and playback—was adequate.

The Modula Executive Desk Pad is an intriguing experiment in PC design but one that will likely remain an executive plaything until the price comes down.

Modula Executive Desk Pad. List price: \$3,250. Requires: 4MB RAM, VGA or SVGA video card, serial port, Sound Blaster-compatible audio card, Microsoft Windows 3.x or later. Source Innovations Inc., Long Beach, CA; 310-988-6574; fax, 310-988-6570; <http://www.iwsc.com/shoppers/electronics/modula>. Circle 406 on reader service card.

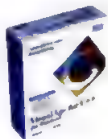


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COMMUNICATIONS

E-Mail Connection 3.0: The Only E-Mail Box You'll Need

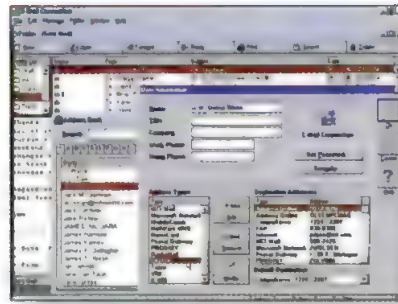
By J.W. Olsen

The \$49.95 E-Mail Connection 3.0 is the most universal e-mailbox for Microsoft Windows 3.x and Windows 95 we've seen. EMC supports more online services, pagers, and fax modems than its competitors, and it offers MIME and uuencode attachments for the Internet and S/MIME encryption as well. Its overall stability, power, and flexibility make it a must-have tool when your e-mail habits take you far and wide in cyberspace.

EMC's appeal lies in its single, integrated address book and its rules-based message interface for virtually all of your e-mail services (including direct Internet connections), your fax

modem, and your SkyTel pager. EMC also removes the mystery from e-mail addressing and routing of messages by handling all the gory details for you. We found EMC 3.0 more versatile, more responsive, easier to use, and significantly less resource-hungry than other integrated solutions, such as Symantec's Delrina CommSuite 95 and Microsoft Exchange for Windows 95.

The most notable enhancement to EMC's support for online services is the addition of America Online. For users of the Microsoft Network, EMC allows you to send mail, but you can't access your own MSN account directly.



GET IT TOGETHER: E-Mail Connection 3.0 puts all of your e-mail addresses and contacts in a single location.

Unfortunately, one of the most promising additions to EMC is also one of its weakest—the fax module. Incoming faxes simply aren't as readable as they are with such alternatives as WinFax PRO and others. And the last word of an outgoing fax often wraps around to its own line, creating an orphan.

You can attach documents from most Windows applications either by point-and-click within

EMC or via an EMC print driver from within an application. Although the print driver yields good results, the point-and-click option simply didn't work. Lastly, the main EMC and fax modules occasionally conflict with each other when accessing a fax modem. ConnectSoft is reviewing these glitches and promises a maintenance release.

For PC faxing, you may want to look elsewhere for now. But when it comes to integrated e-mail services, look no further than E-Mail Connection 3.0.

E-Mail Connection 3.0. Estimated street price: \$49.95. Requires: 8MB RAM, 15MB hard disk space, Microsoft Windows 3.x or Windows 95. ConnectSoft Inc., Bellevue, WA; 800-889-3499, 206-827-6467; <http://www.connectsoft.com>. Circle 403 on reader service card.

UTILITIES

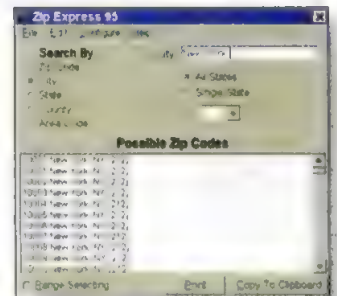
ZIP Express Helps Find the Right Address

By David Haskin

Getting the address and ZIP code right can make the difference between whether an important letter gets to its destination or not. Insight Software Solutions' \$39.95 ZIP Express is a simple tool for making sure your mail isn't marked "Return to Sender."

This little utility enables you to search for ZIP codes by city, state, county, or area code. Or you can type a portion of a ZIP code and see the city, state, and time zone in which it is located. You then can paste the information directly into a document or database.

ZIP Express's macros let you launch a ZIP code search from within other applications and control how the information is inserted into your application. Unfortunately, it can't find a ZIP code based on a street address. If you search for a ZIP code in New York City, for ex-



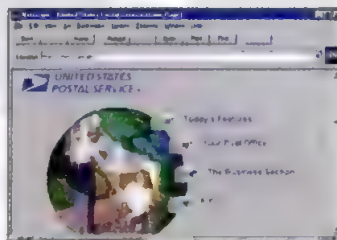
LETTER CARRIER: ZIP Express can search for postal codes by city, state, or area code, but not by street address.

Through Rain, Sleet, or Modem

The days of thumbing through old, dog-eared directories at crowded post offices to find the correct ZIP code are over, thanks to the Internet.

The United States Postal Service—a favorite target of ridicule—deserves credit for embracing the World Wide Web with a site (<http://www.usps.gov>) that is both helpful and easy to use.

From the site's home page, click on Your Post Office and then on ZIP codes to access the service. The ZIP Code Lookup form allows you to enter a business name or address and obtain the exact ZIP+4 code. Unlike



ZIP Express, the Postal Service allows searches by street address; it provided us with the exact postal code when we entered an address in a large metropolitan area.

Other useful ZIP code sites include Semaphore's National Address and ZIP+4 Browser (<http://www.semaphorcorp.com>)—good for ferreting out addresses when you have only partial information—and Stardot Consulting's The Zipper (<http://www.voxpop.org/zipper>), which allows you to enter a ZIP code and get links to the members of Congress in that area.—John Morris

ample, ZIP Express merely displays a long list of the possible postal codes.

ZIP Express is difficult to set up, and there are easier and cheaper options (see the sidebar, "Through Rain, Sleet, or Modem"). Nevertheless, ZIP Express is a useful tool for minor tasks such as verifying that a ZIP code matches a city.

ZIP Express. List Price: \$39.95. Requires: 4MB RAM, 2.3MB hard disk space, Windows 95. Insight Software Solutions Inc., Bountiful, UT; 801-295-1890; fax, 801-299-1781. Circle 401 on reader service card.

Right Track.

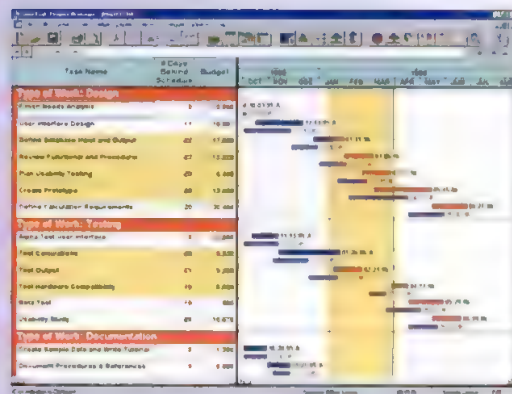
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First Looks

COLOR LASER PRINTERS

DEC's Colorwriter Adds Color To Workgroup Printing

By John Morris

Digital Equipment Corp.'s \$10,000 (street price) Colorwriter LSR 2000 is a color laser printer that is capable of producing excellent continuous tone 600-dot-per-inch (dpi) images, and it has enough muscle to keep up with departmental printing demands.

Based on the same Canon print engine used in Lexmark's Optra C, the LSR 2000 is rated at 12 pages per minute (ppm) for monochrome and 3 ppm for color prints. The secret to the LSR 2000's success is its Electronics For Imaging's (EFI) Fiery controller, which uses dedicated XJ RipChips to take the load off the printer's 100-MHz RISC processor.

The LSR 2000 consistently produced near-photographic-quality images with vivid colors and good detail, even when printing on standard photocopier paper. In four-color mode, small text appeared a little muddy; in gray-scale mode, the edges of printed text were crisp. All in all, the quality of the LSR 2000 was more than sufficient for most color proofing jobs.

Setup of the printer was easy. The cyan, magenta, yellow, and black toner cartridges slide easily into color-coded bays. The toner cartridges are rated for 4,000 pages at 5 percent coverage; the printer's monthly duty cycle is 20,000 pages. Altogether, installation of the toner cartridges, drum cartridge, waste toner bottle, and silicon oil bottle, required less than 10 minutes.

The weak link is the LSR 2000's control panel. We had to print a special legend map and instruction sheet, and we frequently had to consult the documentation to configure the printer for an IPX network. In addition, you can only enter the setup routine while the printer is starting up. The rear panel has ports for par-



ALL-IN-ONE: The Colorwriter LSR 2000 does double duty as a workgroup color and text printer. Its output was consistently bright and sharp.

allel, Ethernet, Centronics, and SCSI connections.

In general, the LSR 2000 was competitive in gray-scale mode with 12-ppm network printers ("Share & Share A Lot," June 11, 1996), excelled on the Multiple Print Jobs test, and performed well on our Microsoft Word speed tests. It lagged behind the HP LaserJet 5M and Okidata OL

1200NPS, however, on spreadsheet and CorelDraw tests. It should be noted that, except for the 100-Page Text and Graphics test, tests were run on the other 12-ppm printers using PCL; the LSR 2000 used PostScript Level 2.

The LSR 2000's paper tray holds 250 sheets, and there is a status bar on the front that warns you when the paper supply gets low. Unfortunately, the LSR 2000 can't accept envelopes, labels, or tabloid-size (11- by 17- inch) paper. The printer is rated at 4 cents per page monochrome and 9 cents per page color based on 5 percent coverage.

The LSR 2000 includes Fiery XJ Downloader (for printing PostScript and EPS files without the files' native applications) and Fiery XJ Spooler (for managing and queuing print jobs). To use the AppleTalk utilities on an Ethernet network, you need a third-party program such as CoOperative Printing Solutions' CopsTalk or Farallon Computing's PhoneNet PC PT100.

For the LSR 2000's \$10,000 price tag, you can buy the Editors' Choice-winning HP LaserJet 5M monochrome laser network printer for \$1,750 and still have more than enough money left over to buy a color laser printer. But if you're looking for a network color workhorse, the Colorwriter LSR 2000 is for you.

Colorwriter LSR 2000. Estimated street price: With 32MB RAM and Adobe PostScript Level 2, \$10,000. Requires: PC parallel port or network connection. Digital Equipment Corp., Printing Systems Business, Marlboro, MA; 800-777-4343; <http://www.digital.com>. Circle 408 on reader service card.

UTILITIES

GreenForm Fills In the Blanks

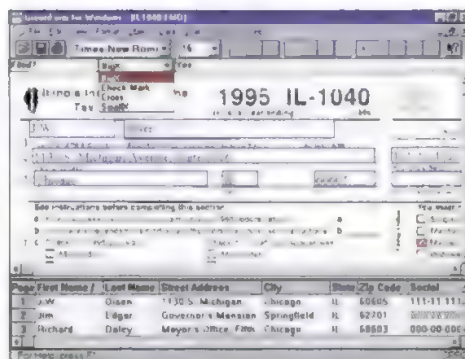
By J. W. Olsen

Until now, if you had to enter data onto forms and print them, you did it by hand, with a typewriter, or by inserting blank forms into your printer and hoping that they would align correctly. The \$69.95 GreenForm 1.6 from GreenSoft automates the process and makes it almost mistake-proof.

You start by loading a form into GreenForm's top window via an ISIS or Twain-compatible scanner, fax modem, or graphics file. You then define data fields by clicking where you want them and resizing them. You can similarly insert check boxes.

Field names you assign appear in the data table in GreenForm's bottom window. You can

resize and reposition fields in both windows even after saving the form. Data can be imported from and exported to other programs by way of comma-delimited files. But unlike some more-complex products, you can't annotate the forms, erase portions of them, or apply redlining, sticky notes, or



CHECK IT OUT: GreenForm lets you insert check boxes as easily as text boxes by clicking where you want them to appear, then resizing the boxes.

user-defined stamps.

GreenSoft offers a generous variety of hotkeys to speed data entry. Unfortunately, some hotkeys didn't work. GreenSoft says you can download patches from their BBS (805-388-5464) that fix many of these.

Minor warts aside, GreenForm is the easiest way there is

to fill out forms on your PC.

GreenForm 1.6. List price: \$69.95. Requires: 8MB RAM, 3MB hard disk space, Microsoft Windows 3.x, Windows 95, or Windows NT, fax modem or ISIS or Twain-compatible scanner. GreenSoft Corp., Camarillo, CA; 800-588-3375, 805-388-1700; fax, 805-388-0660. Circle 407 on reader service card.

A person is shown from the side, slumped over a desk in a posture of extreme physical and mental exhaustion or pain. Their head is buried in their hands, and their back is curved into a sharp 'C' shape. The background is a warm, hazy, golden-brown color, suggesting a dimly lit room or a sunset. The overall mood is one of despair and physical suffering.

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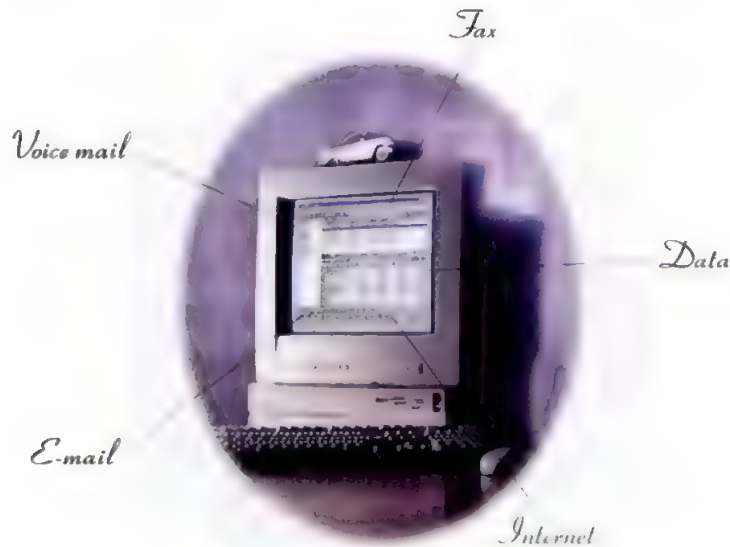
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Schedule+ and Seven Habits Tools: The Software Of Successful People?

By Jan Ozer

Taking a cue from Stephen Covey's *The Seven Habits of Highly Effective People*, Microsoft and the Covey Leadership Center have created a useful resource that adds onto Schedule+ for Windows 95. The \$49.95 enhancement, Seven Habits Tools, adds performance monitoring tools as well as improved print functions, which alone make it worth the price.

Schedule+ adopts all the *Seven Habits* basics. It has wizards for developing mission statements, identifying critical roles, and setting weekly goals. Even for those who haven't read the book, the concepts are useful and easy to learn.

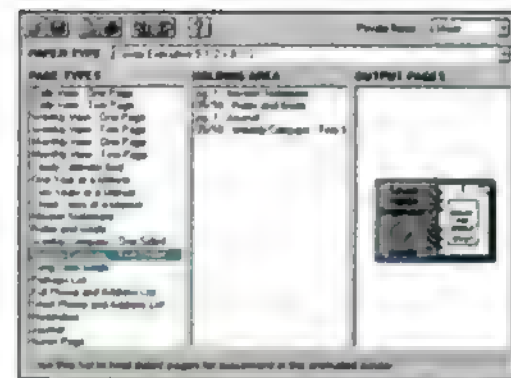
Covey's Tools adds three tabs to the Schedule+ interface: a Journal, a dialog box for helping you evaluate how closely you've followed the *Seven Habits* dictums, and tools for measuring the achievement of your goals. These functions add value, but to be effective they also require dedication.

In contrast, Covey's enhanced print functions will quickly become indispensable to Schedule+ users. You begin with an exercise to configure the printer and learn how to insert the paper properly. Next you build a template containing the forms you print each week, such as daily To Do lists and weekly overviews,

and then you print, either on plain paper or Covey forms. After your next planning session, you simply load the template and print.

While Schedule+ alone supports only Avery and Filofax organizers, Covey outputs to Covey, Day Timer, Franklin, and Rolodex forms of most shapes and sizes. The output is similar to the preprinted forms from Covey's *Seven Habits Organizer*.

While PIMs like Schedule+ are unquestionably more efficient, many users refuse to part with the convenience of their hard copy organizers. Through its high-quality hard copy, Tools



GOOD HABITS: *Seven Habits Tools* includes wizards for developing a mission statement and printing on a variety of popular formats.

marries the power of a PIM with the easy familiarity of a paper organizer, creating a synergy worthy of the Covey Organization.

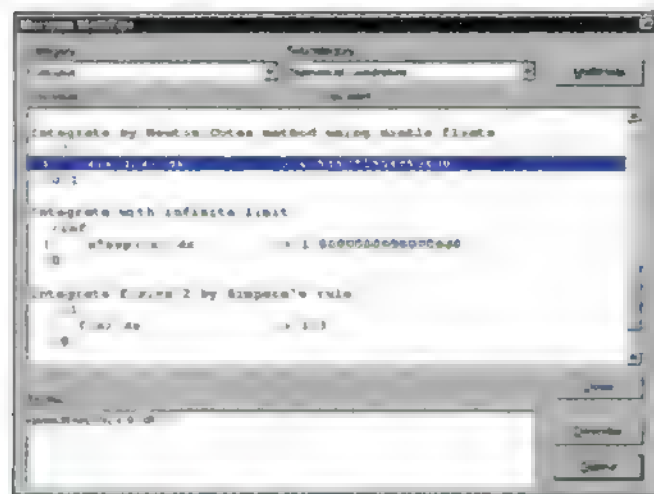
Seven Habits Tools. List price: \$49.95. Requires: 8MB RAM, 2.5MB hard disk space, Microsoft Windows 95, Schedule+. Covey Leadership Center, Provo, UT; 888-942-6839; <http://www.covey.com>. Circle 402 on reader service card.

MATHEMATICS

Macsyma 2.1: Your Personal PC Math Tutor

By Barry Simon

The battle among the powerhouses of symbolic math software continues unabated with the recent release of Maple and the pending release of Mathematica later this year.



EXTRA HELP: Macsyma's Math Tips Advisor tells you what methods are available for an operation such as numeric integration and provides the appropriate syntax.

Macsyma Software has come out swinging with its \$599 Macsyma Version 2.1, the first release geared explicitly for Microsoft Windows 95.

Macsyma has long had one of the most extensive and useful help engines of the symbolic math programs. First, it has a conventional Windows help file but with an extra wrinkle: Many items have demos and examples that load interactive mini-tutorials into the program.

Second, it has an outline-based math help file similar to one pioneered by Maple. For example, you can select Data and Statistics at the top level, then pick Least Squares Fits, and finally choose one of the explicit least squares functions. Then you can click on Describe to jump to the appropriate help file, demo, mini-tutorial, or template.

Macsyma 2.1 adds Math Tips Advisor to the help system; the Advisor shows you how a func-

tion operates and then provides the name and syntax for that function. For a program like Macsyma, with literally thousands of built-in functions, the Advisor is exceedingly handy.

By nature, symbolic math packages focus on formulas and symbols, rather than on data collection and analysis. But among their myriad functions, these programs also provide operations that are ideal for numerical analysis of data. Macsyma 2.1 provides a new set of tools for data collection and analysis that are a welcome addition for any user who needs to mix theoretical math with data-centric calculations.

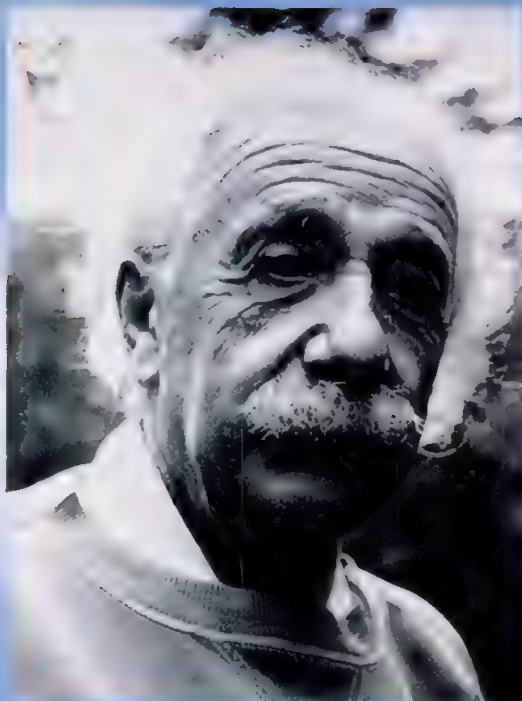
The most interesting item in this mathematical toolbox is a data editor, which lets you embed spreadsheet-like objects into Macsyma worksheets. You can import data in ASCII columnar or comma-delimited format. Unfortunately, you can't directly import Excel or Lotus 1-2-3 files—a major omission. Also missing from this version is the ability to use OLE to embed actual Excel data.

Macsyma 2.1 boasts dozens of

new and improved mathematical functions. For example, eigen analysis of matrices has been strengthened with the implementation of Schur's method for eigen vectors and Jacobi's method for symmetric matrices. For physicists and chemists, there is an expanded set of functions for dimensional analysis, a database of chemical properties, and a library of physical constants.

With these enhancements, Macsyma users will surely want to upgrade; users of other symbolic math programs aren't likely to find any of the new features compelling enough to make the switch. Nevertheless, Macsyma has kept up with stiff competition by building an attractive program with the most comprehensive help package in its class.

Macsyma Version 2.1. List price: \$599. Requires: 8MB RAM (12MB recommended), 17MB hard disk space (28MB hard disk space for virtual memory), Microsoft Windows 3.x, Windows 95 or Windows NT. Macsyma Inc., Arlington, MA; 800-622-7962, 617-646-4550; <http://www.macsyma.com>. Circle 404 on reader service card.



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BOOKS

The Fine Art of Fine-Tuning Windows 95

By Jeff Proisie

With about 400 Windows 95 books either already available or on their way to market, it's tempting to say that we don't need another one. Yet a good book is the shortest route to becoming thoroughly acquainted

with a new operating system. It's not that there aren't enough Windows 95 books; it's that there aren't enough good ones.

Ostensibly, at least, the five books we review here don't just tell you how to use Microsoft Windows 95; they tell you how to

make it work the way you want it to. Don't expect a miracle, but with the tips you'll get from these books you'll be better prepared to cope with the curves Windows

Visit <http://www.zdnet.com/pcmag/discuss.htm>, July 22 to 26, to discuss Windows 95 tips.

www.pcmag.com

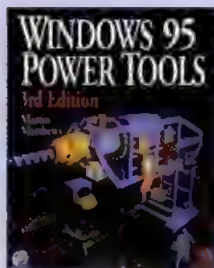
95 throws at you and to take charge when problems occur.

Only two of the books reviewed here—*The Mother of All Windows 95 Books* and *Windows 95 Power Tools*—come with CD-ROMs. But don't let that deter you from getting the others: These days, many CD-ROMs are thinly disguised sales gimmicks.

Making Windows 95 Work for You



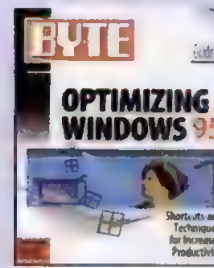
● Greg Perry's *1001 Windows 95 Tips* (\$39.95) is an encyclopedia of tips and tricks that's structured in such a way that it can double as a tutorial. There really are 1,001 tips, and some are real jewels. But too many of them—such as “Lining Up Icons on the Desktop” (Tip: Right-click the desktop and select “Line Up Icons” from the menu), “Invest in a Tape Drive,” and “Using a Text Box to Type in Data”—will hardly come as news to anyone who's spent 30 minutes playing with Windows 95. If it's hot tips you're after, look elsewhere. But *1001 Windows 95 Tips* is a handy topical reference for new users of Windows 95 and perhaps for those who are brand new to computers as well. <http://www.jamsa.com>; ISBN: 1-884133-15-0.



● Back in 1988, *DOS Power Tools* defined a new genre of computer books by bundling a disk full of utility software with every copy. In keeping with that tradition, *Windows 95 Power Tools* (\$40), by Martin S. Matthews, combines a broad overview of the Windows 95 operating system with a CD-ROM containing some 24 programs—most of them shareware and a few of them crippled. *Windows 95 Power Tools* lacks the depth of coverage found in many of its competitors. Savvy users will probably prefer either the *BYTE Guide to Optimizing Windows 95* or *The Underground Guide to Windows 95*. And if it's the software you're after, you'll get more with *The Mother of All Windows 95 Books*. <http://www.randomhouse.com>; ISBN: 0-679-75587-X.



● Scot Finnie is one of those authors who writes as if he were talking to you. Read his new book, *The Underground Guide to Windows 95* (\$19.95), and you'll feel as if he's sitting right across the table. Finnie describes the nooks and crannies of Windows 95. He begins with an overview of the system and ends with a series of “cheat sheets,” which document little-known keyboard shortcuts and obscure (but useful) Explorer command-line options, among other things. If you're already acquainted with Windows 95, you'll enjoy flipping through the pages and reading the juicy tips scattered throughout the book and marked with boldface type and magician's wands. These alone are worth the price of admission. <http://www.aw.com/devpress>; ISBN: 0-201-40652-7.



● Don't let the title mislead you: The *BYTE Guide to Optimizing Windows 95* (\$29.95), by Lenny Bailes with Charles Bermant, Craig Menafee, and John Heilborn, is more about using and understanding Windows 95 than about optimizing it. But it's terrific nonetheless. The chapters on networking are especially helpful, and it's chock full of technical details describing the problems you're likely to encounter in Windows 95 and what you can do to solve them. Ever wonder why your trusty Internet browser stopped working the minute Windows 95 was installed, or why the Windows 95 “Easter egg” doesn't work on some systems? The *BYTE Guide to Optimizing Windows 95* has the answers to these and other problems. <http://www.osborne.com>; ISBN: 0-07-882120-7.



● With its title, *The Mother of All Windows 95 Books* (\$39.95), by Woody Leonhard and Barry Simon, has a lot to live up to. For the most part, it fulfills its promise with more than 900 pages of tips and tricks. The crowning jewel is a detailed discussion of the registry and methods for tweaking the system by adding, deleting, and modifying registry entries. The bundled CD-ROM includes the entire Windows 95 Driver Library and what is probably the world's largest collection of freeware and shareware. Much of the text is a dialogue between caricatures of such figures as Bill Gates and Rush Limbaugh. At times, it's like *DOS for Dummies* in drag. But if you can get past the book's overly cute style, there are treasures to be found. <http://www.aw.com/devpress>; ISBN: 0-201-40971-2.

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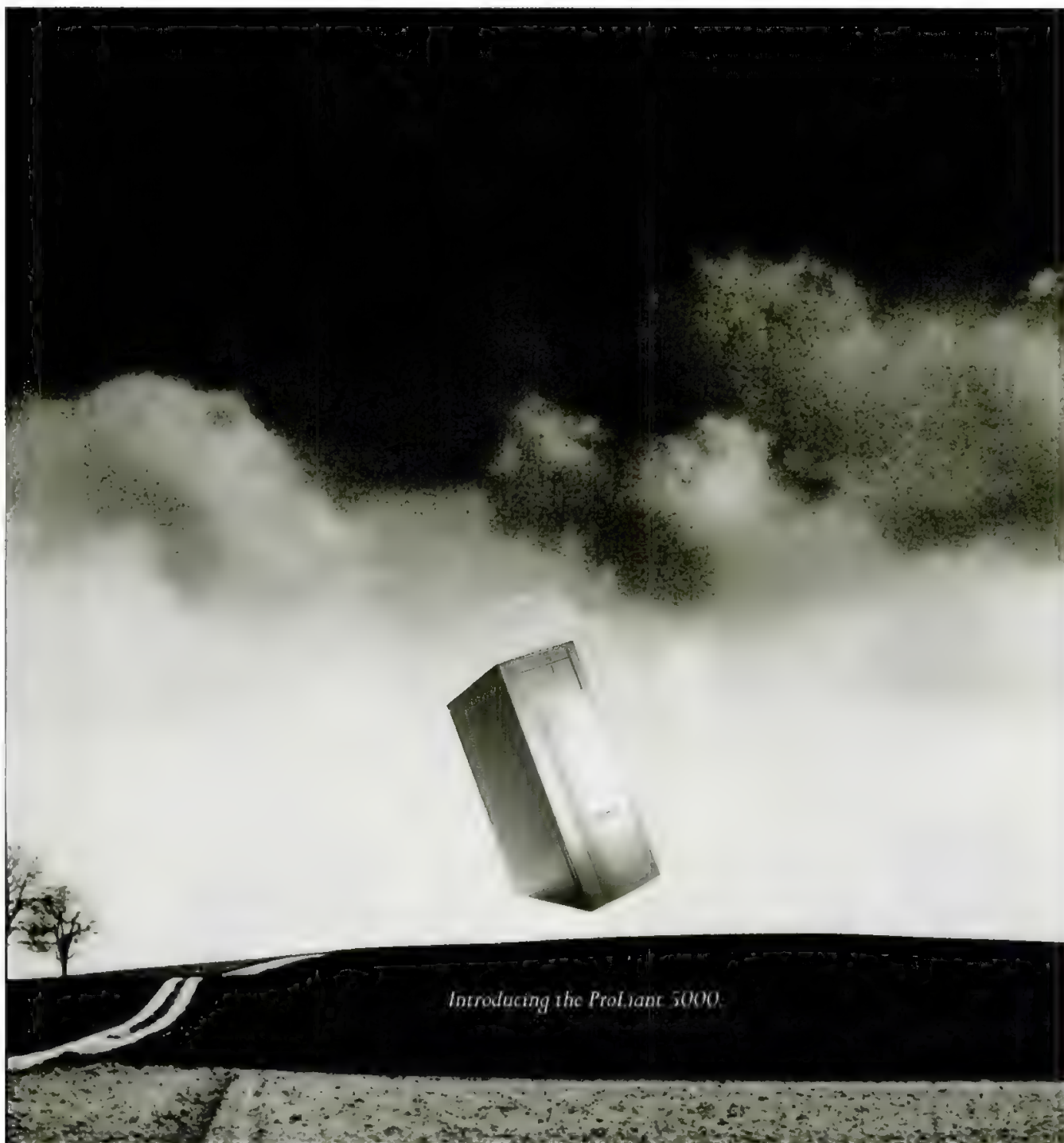
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IBM RS/6000 J30	3631	\$289

*A lot of companies claim to offer the lowest cost of ownership. But we have the benchmarks to prove it.**



© 1996 Compaq Computer Corporation. All rights reserved. Compaq registered U.S. Patent and Trademark Office: ProLiant, SmartStart, and Insight Manager are registered trademarks of Compaq Computer Corporation. The Intel Inside Logo and Pentium are registered trademarks and the Pentium Processor Logo and the Pentium Pro Processor Logo are trademarks of Intel Corporation. All other brands and product names are trademarks or registered trademarks of their respective companies. *Published TPC C results as of 6/96. The TPC C test is a transaction-oriented OLTP environment. *Results withdrawn as of 4/17/96. In Canada, we can be reached at 1-800-567-1616.

THE PROLIANT 5000 AFFECT SAY ITS CODE NAME WAS "HURRICANE."



COMPAQ

Has It Changed Your Life Yet?

"OF THE THREE PROGRAMS TESTED ONLY UNINSTALLER DID NOT OFFER TO REMOVE CRUCIAL WINDOWS FILES."

— PC MAGAZINE ONLINE, FEB. 26, 1996

(After reviewing UnInstaller,™ CleanSweep® and Remove-It!)

Only UnInstaller™ from MicroHelp gives you absolute peace of mind to safely clean-up your hard drive. With its exclusive SmartLinks™

technology, UnInstaller performs an intelligent series of scans on your hard drive until it thoroughly understands the inter-relationships of files and programs. Without this technology, even an experienced user may find it easy to accidentally remove a crucial file.



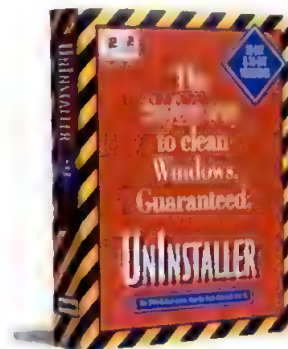
It's what you don't see on your hard drive that causes problems. Every application puts bits and pieces of itself in places you don't know about. Without UnInstaller, things can slow down — or come to a screeching halt.

And, as an added safety net, UnInstaller automatically compresses and backs-up everything it removes. So, as you clean off bits and pieces of old files, you can take comfort in being able to put things back exactly as they were with the simple click of a button.

Of course, with other deletion programs you can have the experience of getting rid of things you never meant to get rid of. Which may be good for us, but bad for you.



Despite popular belief, Windows 95 applications aren't very thorough at automatically removing themselves from your hard drive. Regardless of which version of Windows you use, you need UnInstaller to continually clean things up. UnInstaller Works with both 16-bit and 32-bit applications.



Why take your chances with just any old clean-up program? UnInstaller is the No. 1-selling Windows utility on the market with more than a million copies sold.



1-800-922-3383

Available at your local software store.
MicroHelp is at www.microhelp.com

CIRCLE 214 ON READER SERVICE CARD

PowerDesk, the highly acclaimed file management and desktop enhancement utility that truly unleashes the hidden power of Windows 95, is also a MicroHelp product.



©1996 MicroHelp, Inc. All rights reserved. UnInstaller, PowerDesk and SmartLinks are trademarks of MicroHelp, Inc. All other trademarks are properties of their respective owners. Windows is a registered trademark of Microsoft.

MicroHelp

HEY, EVERYONE CAN USE A LITTLE HELP.

Second Looks

LIVING WITH THE PRODUCTS WE REVIEW

By Brian Nadel

HTML EDITORS

Microsoft Cleans Up FrontPage

BY ADOPTING A STRAIGHTFORWARD DESKTOP PUBLISHING paradigm, Microsoft's FrontPage (First Looks, February 20, 1996) has made the World Wide Web a friendlier place to publish. But Second



Looks readers who use Windows for Workgroups have written to complain that FrontPage 1.0's Personal Server module is sometimes unable to locate a valid TCP/IP stack. When users start the program, they see the error message, "Could not get socket." This means Windows for Workgroups users can't preview their work.

The fix is as easy as the bug is frustrating. Start by saving the WINSOCK.DLL file under a different name, just in case. Then download and install WFWTCP.EXE and TCP32B.EXE, which will update the system's TCP/IP stack. The software is available from the company's Web site (<http://www.microsoft.com>) and the Microsoft Download Service (206-936-6735).

V.34 MODEMS

Modems on The Move

THE THREE V.34 MODEMS that recently won Editors' Choice awards have proven themselves to be speed demons that hardly miss a bit. Two of them, U.S. Robotics' Courier V. Everything ("V.34: Off the Starting Blocks," March 14, 1995) and Motorola's Power 28.8 Data/Fax Modem ("Hooking Up with Home Modems," October 24, 1995), are now leading the move to 33.6-Kbps communications, allowing them theoretically to pump 17 percent more data through a phone line. The upgrade for the third modem, the



Cardinal 28.8 External Fax Modem (also reviewed in the October 24 roundup) wasn't ready in time to test, but it should be available by the time you read this.

The upgrade of the V. Everything modem was the easiest and least expensive, and it produced the most benefit. Because the modem already has all the necessary equipment inside and its firmware is stored on a flash memory chip, all you do is download the upgrade file from the U.S. Robotics bulletin board (874-982-5092) and run the program (USRDL.EXE) with the modem attached to your PC's serial port. By contrast, it will cost you \$99 to upgrade the Power 28.8 modem, you'll lose the use of the modem for a few days, and you won't get as much out of it. Ship

your Power modem to Motorola (800-566-3266) and the vendor will send you a new Premiere 33.6 modem, which sells for about \$400.

How fast is fast enough? On our Telephone-Network Simulation test, the Premiere actually lost ground, with a data throughput result that was 23 characters per second (cps) slower than the Power modem it replaces. On the Throughput vs. File Type test, the Premiere showed a slight improvement, but one that is hardly

up to the modem's potential. The V. Everything modem showed significant gains on both tests.

Are these modest improvements worth the effort? For now, most phone lines can barely sustain a 21-Kbps connection, much less a 33.6-Kbps one. On the other hand, every little bit helps, and these upgraded modems offer the bonus of more features and software than their predecessors. —Steve Buehler and Jim Wolf contributed to this report.

BUG BRIEFS

PROBLEM

► DeltaPoint's QuickSite 1.0 Web page creation and site management program (First Looks, May 14, 1996) lacked a strong Table editor and the ability to work with the latest HTML tags.

► Although it contains a slew of useful power PIM features, Lotus Organizer has a reputation as one of the slowest ways to get contact information into and out of your PC.

SOLUTION

Version 1.0.2 is available as a free upgrade from the company's Web site (<http://www.deltapoint.com>). You can also download a 30-day trial version of the program.

Lotus not only speeded up the program, but added better data compression and phone-dialing support for IBM Mwave DSP modems. The three-disk upgrade for Version 2.11 is available by mail (800-872-3387).

Telephone-Network Simulation

Characters per second	2,500	3,000	3,500
Motorola Power 28.8	3,329		
Motorola Premiere 33.6	3,306		
USR Courier V. Everything 28.8	3,147		
USR Courier V. Everything 33.6	3,461		

BETTER ►

LOOKING AHEAD

Tell us what you love and hate about these products and we'll share the information in future issues. • 3-D software and hardware • Color ink jet printers • CD-

ROM encyclopedias • EZ SCSI 4.0 • Lotus Notes Release 4 • Microsoft Internet Explorer • Netscape Navigator 2.0 • Pentium Pro PCs • RealAudio •

SoftWindows • Windows 95 utilities. Contact Brian Nadel via MCI Mail (556-1500) or CompuServe (72241,1616), or on the Internet at BNadel@zd.com.

IT TOOK GUTS TO TELL THIS STORY.



The secret is out. Yes, that is a Mitsubishi DiamondTron™ tube going into the new CTX Professional monitors.

So now, you get the best of both worlds. The finest .25mm aperture grill images money can buy. Plus CTX value no one else can match.

Ask the test center engineers at CRN, the leading computer trade magazine:

	CTX	Mitsubishi	Sony
Model No.	1785XA	Diamond Pro 17TX	CPD-17SF2
Tube	Mitsubishi DiamondTron	Mitsubishi DiamondTron	Sony Trinitron
Horiz. Freq.	30-85 KHz	30-86 KHz	31-65 KHz
TCO	Yes	Yes	Yes
MSRP	\$999	\$1,059	\$1,099

"Compared with Trinitron®, image quality is similar if not better, text is easier to read, and the whole image is brighter if you want it to be."

Then CTX adds real value. Features like more on-screen controls than you could ever need. Windows® 95 plug and play. TCO certification. Energy-saving power management. PC, Mac and SPARC compatibility. And a hot, contemporary design that will make your desk look great.

All for a price that may be less than you'd pay for many dull, old-fashioned color monitors.

Upgrade now. Ask your dealer for details on the CTX Professional line. And find out why resellers are most likely to recommend CTX by far over any other monitor brand*.

For direct hot-line information, call 1-800-888-2120. For FasFax, call 818-837-4341 (account #26, document #470).



PR700 17" CRT
(16" Viewable area)

PR900 21" CRT
(19.6" Viewable area)

CTX

Commitment To Excellence.

New & Improved

NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Melissa J. Perenson

Keyboards with More

FIRST, THERE WAS COMPAQ's Scanner keyboard, based on Visioneer's page-scanner technology. Now, Visioneer is striking out on its own with the \$349 **PaperPort ix** keyboard with integrated scanner.

Visioneer's product differs from Compaq's in its use of an NMB tactile keyboard mechanism and

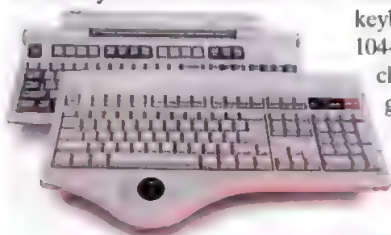
serial port, and a parallel port adapter is available.

Thinking of getting a trackball or touch pad? Recognizing that this decision depends on personal tastes, Key Tronic has covered all bases with its **Lifetime** series of keyboards. The series, priced from \$29.99 to \$149.99, includes both standard and wireless infrared keyboard versions of Key Tronic's 104-key keyboard, with your choice of a conveniently integrated Logitech trackball or Synaptics touch pad.

Visioneer Inc., Palo Alto, CA; 800-787-7007, 415-812-6400; <http://www.visioneer.com>.

Circle 412 on reader service card.

Key Tronic Corp., Spokane, WA; 800-262-6006, 508-928-8000; fax, 509-927-5503. Circle 413 on reader service card.



in its solid CD-ROM software bundle, which includes Netscape's Navigator, Visioneer's PaperPort Vx scanners, the PaperPort ix features four scan modes and resolution of up to 8 bit, 400 dots per inch. The scanner may be connected via the

Sign on the Line

FOR A QUICK, TRANSPORTABLE way to digitize signatures, there's PenWare's \$375 **Portable**

PenWare 100 Signature Pad.

A boon for salespeople on the road, this battery-

operated device makes it easy to transfer signatures into a PC via its serial port. The lightweight pad can be used with a ballpoint pen or a detached, nonelectronic stylus. **PenWare Inc.**, Palo Alto, CA; 415-858-4920; <http://www.penware.com>. Circle 414 on reader service card.



PHOTOGRAPHS BY THOM O'CONNOR

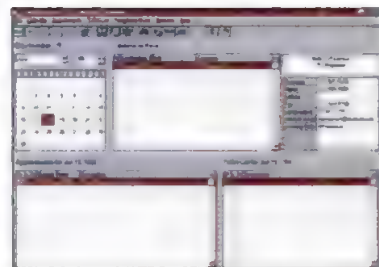
Managing Time...and Chaos

STILL SEARCHING FOR THE PERFECT PERSONAL INFORMATION manager but fed up with bloated, convoluted packages with intimidating learning curves and multiple tab screens for everything you do? iSBister International brings its Time & Chaos PIM to the 32-bit era with the \$45 **Time & Chaos Professional 5.1.5**.

A past winner of a Ziff-Davis Shareware Award, Time & Chaos has traditionally featured an elegantly simple interface that gives you instant access to critical information—your calendar, to-do lists, appointments, and address book with phone numbers—all on a single screen.

For its 32-bit, network-ready incarnation, Time & Chaos has been redesigned, but it still retains its quadripartite organization. New features include right-mouse and long-filename support; MAPI and TAPI access to voice, fax, e-mail, and CompuServe communications; integration with the World Wide Web via your Web browser; OLE 2.0; and integration with Microsoft Excel, Microsoft Exchange, and Microsoft Word.

iSBister International Inc., Garland, TX; 214-495-6724; <http://www.isbister.com>; sales@isbister.com. Circle 410 on reader service card.



HOT PROSPECT

A Digital Camera for Your Pocket

Imagine having a filmless point-and-shoot camera that's slim enough to slide into your pocket, powerful enough to capture high-quality digital images, and yet affordable enough for the home and small-office user. Eastman Kodak Co. enters the low-cost home digital camera market with the \$350 **Kodak Digital Science DC20 Camera**.

Adapting the simplified approach of traditional point-and-shoot cameras to digital photography, the DC20 operates using only three buttons: a power button, a shutter button to snap pictures, and a button for erasing pictures. The camera features resolutions of up to 493 by 373 pixels and a fixed focal-length lens of 47 mm; exposure is automatically set when you depress the shutter button. The shutter speeds can vary from 1/30 to 1/4,000 of a second, while the camera has an ISO value the equivalent of 800 or 1,600, depending upon lighting conditions.

The camera is truly compact, measuring just 2.5 by 4 by 1.2 inches in size, and it weighs just 4.2 ounces, excluding the three-volt lithium battery, which is a standard-size 35-mm camera battery. The DC20 ships with a Twain driver for Windows 3.x and Windows 95, and an Adobe Photoshop plug-in for the Macintosh, PictureWorks' PhotoEnhancer software, and Kai's Power Goo from MetaTools. **Eastman Kodak Co.**, Rochester, NY; 800-235-6325, 716-724-4000; <http://www.kodak.com>. Circle 428 on reader service card.



Spelling Bee

IF THE DICTIONARY IS—OR should be—your constant companion, then INSO Corp.'s **CyberSpell**, **InWords**, and **SciWords** will prove to be worthy additions that are bound to save you from many embarrassing misspellings. The \$24.95 **CyberSpell** is an add-in for the e-mail client of Netscape 2.0 and later. The \$19.95 **InWords**, which is available for Corel WordPerfect Suite, Lotus SmartSuite, and Microsoft Office, is an updated general dictionary with 118,000 English words from both the U.S. and the U.K. The \$69.95 **SciWords** offers spell-checking modules for six different scientific fields.

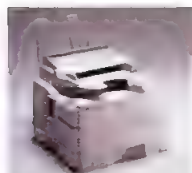
INSO Corp., Boston, MA; 800-333-1395, 312-329-0700; <http://www.inso.com>. Circle 411 on reader service card.

The Multifunction Wave

TAKING THEIR CUE FROM THE COMPUTER INDUSTRY'S printer manufacturers, Sharp Electronics Corp. and Mita Copystar America are building multiple functionalities into their fax products.

The **Sharp F-2700M** is a \$1,249 multifunctional fax machine that is also enabled for use as a four-page-per-minute, 300-dot-per-inch Windows laser printer, a copier, and a phone. The unit comes standard with 512K of memory, a 9,600-bps modem, and a 20-page document feeder. It transmits 4.6 pages per minute and can print from the computer while simultaneously sending or receiving a fax.

Mita's \$2,345 **LDC 750** offers a combined laser fax/copy machine with a six-ppm, 400-dpi Windows laser printer. The LDC 750 features a 14.4-Kbps modem with a transmission speed of 10 pages per minute, a 30-sheet document feeder, and 256K of memory. There's also built-in fax/telephone switching and an integrated answering machine.



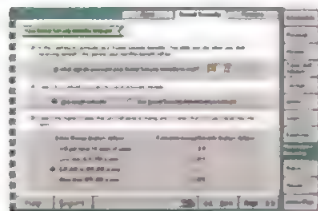
Sharp Electronics Corp., Mahwah, NJ; 800-237-4277, 201-529-8948; <http://www.sharp-usa.com>. Circle 422 on reader service card.

Mita Copystar America Inc., Fairfield, NJ; 800-222-6482, 201-808-8444; fax, 201-882-4421. Circle 423 on reader service card.

Your Finances

GET A HANDLE ON YOUR finances with Intuit's \$40 **Quicken Financial Planner2**. As with other products in the Quicken line, Financial Planner offers an interview guide to put you on the path to a personalized financial plan. New to this version are options for college and life insurance planning; QuickPlan for speedily drafting a basic plan of attack; what-if scenarios; and customized report analyses and printing options.

Intuit Inc., Mountain View, CA; 800-624-8742, 520-295-3110; <http://www.qfn.com> Circle 424 on reader service card.



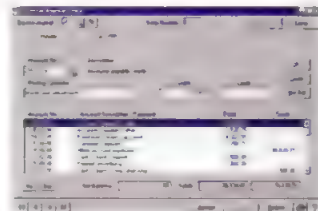
Staff Appraisal

EVALUATING YOUR EMPLOYEES' performance and development has never been easier. Austin-Hayne Corp.'s \$129 **Employee Appraiser 3.0 for Windows** adds several new features, most

notably the ability to import electronic versions of your company's employee evaluation and send appraisals via e-mail using the software's MAPI support. **Austin-Hayne Corp.**, San Mateo, CA; 800-809-9920, 415-655-3800; <http://www.austin-hayne.com>. Circle 425 on reader service card.

Power Accounting for Windows

MOVING TO THE WINDOWS PLATFORM IS STATE OF THE ART'S **MAS 90 for Windows**, an accounting package for midsize businesses that starts at \$599. Building on the foundation of flexible capabilities in earlier DOS-based versions, MAS 90 is a powerful cross-platform solution that includes modules for general ledger, accounts payable, accounts receivable, and bank reconciliation. Organized around the Library Master module, the package can be used over the LAN and is fully backward-compatible with legacy MAS 90 systems. New features include a complete audit trail, custom financial reporting, and support for Visual Basic and ODBC access.



Another client/server accounting package is offered by Advanced Software Development Corp. Priced from \$495 to \$8,995, **U.A. Corporate Accounting, Version 4.0**, offers double-entry accounting for small, medium-size, and large businesses. Eight modules are standard in this 32-bit package: accounts receivable, accounts payable, general ledger, purchasing, inventory control, order entry, job costing, and payroll. The interface has been improved so it closely parallels the functionality of Windows 95's Explorer. United Postal Service's MaxiShip software is now integrated into the program, and the Internet Showroom feature makes it easy to create a Web page so customers can view inventory descriptions and place orders.

State of the Art Inc., Irvine, CA; 800-854-3415, 714-753-1222; <http://www.stateoftheart.com>. Circle 426 on reader service card.

Advance Software Development Corp., New Orleans, LA; 800-859-6607, 504-851-6600; fax, 504-851-6007. Circle 427 on reader service card.

BRIEFS

Books

If you can't beat 'em, work with 'em. That's the motto of **Co-opetition**, the book by Adam M. Brandenburger and Barry J. Nalebuff, which attempts to stake out a whole new way of doing business based on strategic partnerships (\$24.95, Bantam Doubleday, 800-323-9872) Nowadays, nearly any PC comes with a sound card and speakers. Why not get some use out of them? Jeff Essex's **Multi-media Sound and Music Studio** will show you how, and it includes a CD-ROM tutorial with audio samples. (\$45, Random House, 800-793-

2665) Make your mark on the Net with **Guerilla Marketing Online Weapons**, by Jay Conrad Levinson (author of the acclaimed *Guerilla Marketing*) and Charles Rubin (\$11.95, Houghton Mifflin, 800-225-3362).

CAD Software

ViaGrafix's \$500 **DesignCAD 3D for Windows 95** offers a complete set of design, drafting, and 3-D modeling tools. This version adds .DWG file compatibility, an enhanced OLE engine, and customization when using Visual Basic or BasicCAD (800-233-3223) Soft-

desk's **Planix Photo Landscape** is a \$50 package for creating photorealistic designs of any landscape using either the included set of 500 photographs or images that were scanned in or uploaded from a digital camera (800-231-8574) ICEM Technologies' **ICEMetrix for AutoCAD Release 13** parametric editor is a \$487 program that re-creates a drawing whenever you change a dimension (800-799-3932).

Software

Try your software before you buy it. Wugne's \$29.95 **CD Sampler for Windows 95** features

INSTEAD OF A \$4000 MULTIMEDIA NOTEBOOK,
BUY A \$2000 NOTEBOOK AND OUR
\$500 PORTABLE MULTIMEDIA CDROM CENTER.

(DUH.)



If you're in the market for a multimedia notebook, or if you've got a notebook with a Type II PCMCIA slot and built-in 16-bit audio, you're in luck. For just \$500 you can add full multimedia capabilities.

The AMC2800 is a portable, multimedia communications center which complements your notebook with an 8X CD-ROM drive that would be the envy of any desktop computer. And a built-in, full duplex internet phone for true two-way communications.

But it's more than just the fastest, easiest and most affordable way to upgrade to multimedia. Its 4-speaker sound system with audio CD play capability is equally incredible. After all, it features the powerful sound you'd expect from Altec Lansing.

And, of course, before it does any of this, the AMC2800 saves you some serious money. To state the obvious.

For more information on the AMC 2800, call 1-800-648-6663
Multimedia Division, Altec Lansing Technologies, Inc., Milford PA 18337
<http://www.altecmmm.com>



Best Pentium processor-based PC at entry-level price.

- Intel 75 or 100 MHz Pentium processor
- 8-16MB RAM, expandable to 128MB
- EDO RAM
- Optional 256KB cache
- 640MB** high-performance Enhanced-IDE hard drive
- PCI integrated graphics accelerator and 1MB DRAM standard, upgradable to 2MB
- Flash BIOS for easy upgrade
- Designed for Windows® 95
- Preloaded HP DMI Desktop Management Interface
- Free three-year limited warranty for parts and labor¹

from **\$1,262***



HP Vectra VE

Best managed PC.

- Intel 75, 100, 120, 133, 150 or 166 MHz Pentium processor
- LAN Remote Power
- PCI integrated 32-bit 10Base-T Ethernet interface
- Network certified and preconfigured for Microsoft® and Novell clients
- Preloaded HP DMI Desktop Management Interface
- Vectra Op-Center
- Norton Smart Disk Doctor
- Parallel transfer driver preinstalled for faster LAN packet processing
- Advanced security meeting C2 level
- 64-bit graphics accelerator on PCI bus
- 1MB video RAM, expandable to 2MB
- 8 or 16MB EDO RAM, expandable to 128MB
- 840 or 1280MB Enhanced-IDE hard drive
- 4 mass storage shelves (3 front accessible), 4 expansion slots
- Two 32-bit PCI slots
- Flash BIOS for easy upgrade
- Designed for Windows 95
- Free three-year limited warranty for parts and labor¹

from **\$1,513***



HP Vectra XM

Leading Pentium processor/PCI performance at an affordable price.

- Intel 100, 120, 133, 150 or 166 MHz Pentium processor
- Desktop and minitower packages
- 256KB burst synchronous cache
- 8-16MB RAM, expandable to 128MB
- EDO RAM
- PCI/ISA architecture
- 640MB** high-performance Enhanced-IDE hard drive
- PCI integrated graphics accelerator and 1MB DRAM standard, upgradable to 2MB or Matrox Millennium PCI graphics card with 3D acceleration and 2MB WRAM, upgradable to 8MB
- Flash BIOS for easy upgrade
- Full plug-and-play capability
- Designed for Windows 95
- Preloaded HP DMI Desktop Management Interface
- Free three-year limited warranty for parts and labor¹

from **\$1,415***



HP Vectra VL

The ultimate PC.

- Intel Pentium Pro 150, 180 or 200 MHz processor with 256KB integrated cache
- Supports dual processing with secondary Pentium Pro socket
- 128-bit high-performance memory architecture
- 16-32MB ECC DIMM memory standard, expandable to 256MB with 8 DIMM memory expansion slots
- PCI integrated Ultra SCSI Fast 20 interface with 20MB/s throughput
- 1,000MB** SCSI-2 high-performance hard drive
- PCI Matrox Millenium graphics card with 3D acceleration and 2MB WRAM, upgradable to 4MB or 8MB
- 7 mass storage shelves (5 front accessible)
- 6 expansion slots: 3 PCI, 1 PCI/ISA combo and 2 ISA
- 10Base-T/100VG AnyLAN selectable PCI NIC with up to 100 Mb/s throughput
- Integrated 16-bit audio and 4X CD-ROM
- Microsoft Windows NT® 3.51
- Free three-year limited warranty for parts and labor†

from **\$3,939***



HP Vectra XU

Exceptional performance and expandability at an affordable price.

- Intel Pentium Pro 150 MHz processor with 256KB integrated cache
- 128-bit high-performance memory architecture
- 16MB DIMM memory standard, expandable to 256MB with 8 DIMM memory expansion sockets
- 1,000MB** Enhanced-IDE hard drive
- PCI Matrox Millenium graphics card with 3D acceleration and 2MB WRAM, upgradable to 4MB or 8MB
- 7 mass storage shelves (5 front accessible)
- 6 expansion slots: 3 PCI, 1 PCI/ISA combo and 2 ISA
- Integrated 16-bit audio and 4X CD-ROM
- Microsoft Windows NT 3.51 or IBM OS/2® Warp
- Free three-year limited warranty for parts and labor†

from **\$2,615***



HP Vectra VT

Helpful hint: Rip out and pin up next to Compaq and IBM ads.

A little comparison shopping will quickly show you that HP puts the best prices on the most impressive PCs. One standout is the network-ready Vectra XM. It's configured for the most demanding networks with LAN Remote Power, Super-fast LAN install and HP Vectra Op-Center for more effective remote management. Every Vectra will outshine the competition when it comes to features and price. From the Pentium processor-based PCs to the dual Pentium Pro processor-based HP Vectra XU PC. For more information or the name of your nearest HP reseller, call 1-800-322-HPPC, Ext. 1703† Or visit us at <http://www.hp.com/go/vectra>.

Of Integrals And Equations

FED UP WITH BOTHERSOME word processor add-ons and ongoing problems getting your mathematical equations to appear properly formatted? Brooks/Cole Publishing's **EXP: The Scientific Word Processor, Version 4.0**, eliminates formatting problems altogether by providing an easy-to-use word processing environment with integrated WYSIWYG chemical and mathematical formatting abilities. New to

this version are LaTeX file conversion, styles, and templates.

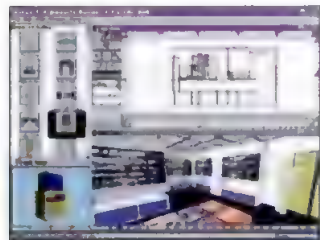
If your needs are more along the lines of statistical analysis, there's Abacus Systems' \$595 **StatView for Windows**. This 32-bit program finally brings Abacus's popular Macintosh statistics, graphing, presentation, and data management tool to the Windows platform.

Brooks/Cole Publishing, Pacific Grove, CA; 800-354-0092, 408-373-0728; fax, 408-375-6414. *Circle 418 on reader service card.*

Abacus Concepts Inc., Berkeley, CA; 800-666-7828, 510-540-1949; <http://www.abacus.com>. *Circle 419 on reader service card.*

Web Content Creators

ADOBE SYSTEMS' DOCUMENT AUTHORIZING SOLUTION, **Adobe FrameMaker 5**, enters the 32-bit world. This \$895 cross-platform package offers a powerful suite of tools for creating publications of all shapes and sizes. Now available in beta is Adobe's



FrameMaker HoTaMaLe plug-in for Windows 95, which converts Adobe FrameMaker documents into HTML documents.

Want to create a site using VRML? Virtus Corp.'s \$99 **Virtus 3-D Website Builder** will help you do so with ease. You can create virtual worlds using a drag-and-drop 3-D VRML interface. Website Builder is based on a simplified version of the technology behind Virtus's Walkthrough Pro software. **Adobe Systems Inc.**, Mountain View, CA; 800-843-7263; <http://www.adobe.com>. *Circle 420 on reader service card.*

Virtus Corp., Cary, NC; 800-847-8871, ext. 3021; 919-467-9700; <http://www.virtus.com>. *Circle 421 on reader service card.*

The Latest in Notebooks

IF THE NOTEBOOKS REVIEWED ELSEWHERE IN THIS ISSUE don't suit your fancy, consider one of these units, all of which arrived too late to be included in either First Looks or our notebook roundup. Standard features in all of these systems include 16-bit stereo sound, a modular floppy disk drive, a Type III PC Card slot, PCI architecture, 256K L2 cache, and an IrDA port.



Fujitsu PC Corp.'s **Monte Carlo**, priced from \$3,300 to \$5,000, is designed for power users. This model is available with a 100-, 120-, or 133-MHz Pentium processor, 8MB or 16MB of EDO RAM, your choice of an 11.3-inch or 12.1-inch active-matrix display, and either an 810MB or 1GB hard disk. The 7.3-pound Monte Carlo also features a six-speed CD-ROM, 2MB of VRAM, MPEG support, and a lithium ion battery. Unique to the Monte Carlo is Fujitsu's unusual ErgoPoint pointing device, which combines the merits of a trackball and pointing stick in one.

Dell Computer Corp. builds upon the foundation of its Latitude line of notebooks with the new Dell Latitude LM. The 7.1-pound, \$3,499 **Latitude LM-P133** comes with a 133-MHz Pentium CPU, 8MB of RAM, a 540MB hard disk, a quad-speed CD-ROM drive, a 12.1-inch active-matrix display, a 128-bit graphic accelerator, a touch pad, and a lithium ion battery. The low-end \$2,799 **Latitude LM** has the same features, except for a 100-MHz Pentium CPU and an 11.3-inch dual-scan display.

Joining the notebook parade is Hitachi PC Corp.'s M Series. The \$5,500 **M-133T** features a 133-MHz Pentium CPU and a 6X CD-ROM drive. It comes standard with 16MB of EDO RAM, a 1GB hard disk, an 11.8-inch active-matrix display, a pointing stick, and a nickel hydride battery. The M series integrates a 28.8-Kbps modem, AC adapter, and a 10 Base-T LAN port. **Fujitsu PC Corp.**, Milpitas, CA; 888-466-8434; fax, 408-935-1501; <http://www.fujitsu-pc.com>. *Circle 415 on reader service card.* **Dell Computer Corp.**, Austin, TX; 800-289-3355, 512-338-4400; <http://www.dell.com>. *Circle 416 on reader service card.* **Hitachi PC Corp.**, San Jose, CA; 800-555-6820, 408-321-5216; <http://www.hitachipc.com>. *Circle 417 on reader service card.*



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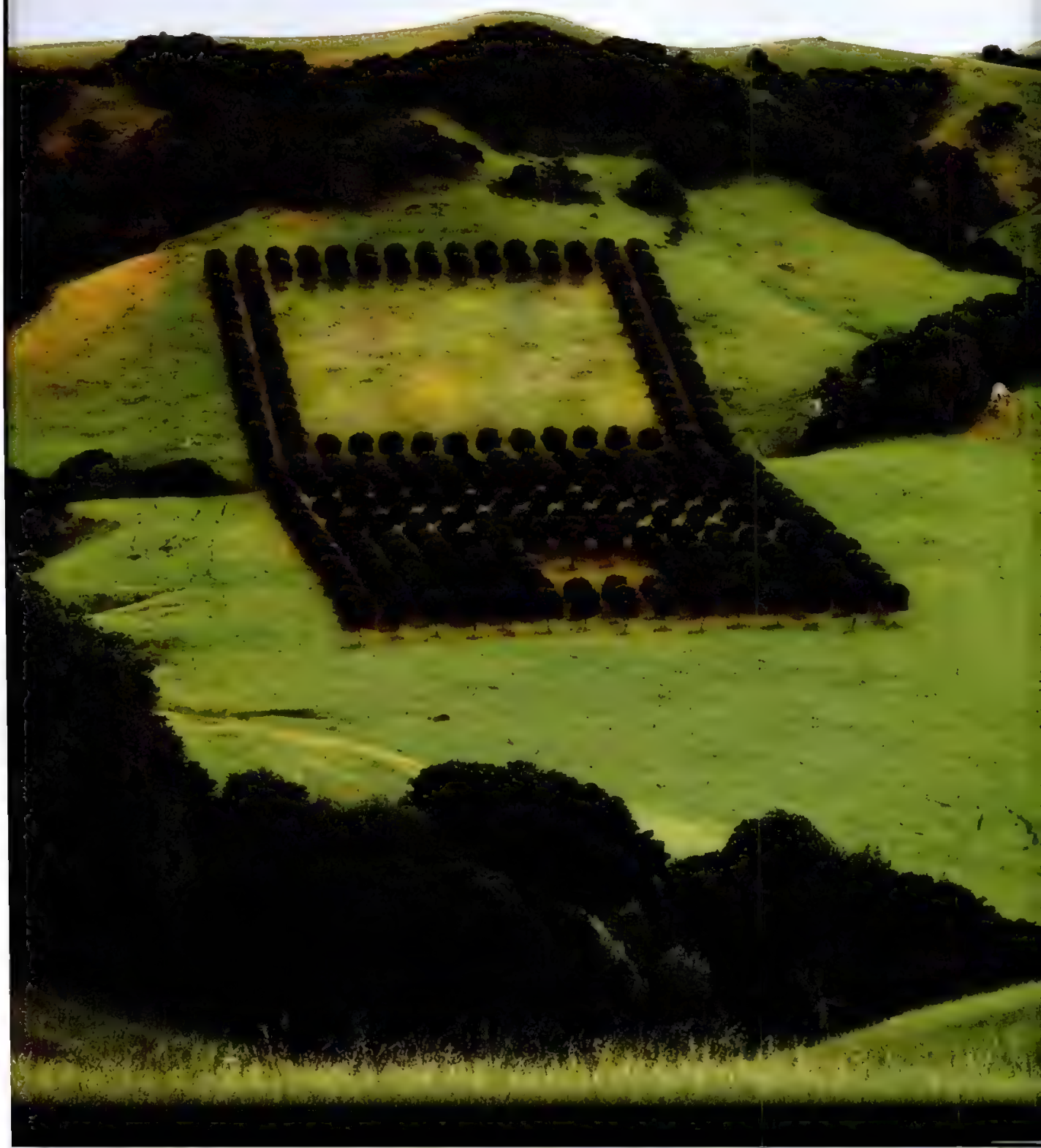
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tion you've downloaded from the Internet for use with word processors, spreadsheets, and other applications (310-468-6600) Fill in or alter existing forms with Virtual Reality Labs' **FormWizard**, a \$60 tool which lets you scan in or fax a paper-based form to your PC, complete the form on-screen, and then print it on your printer (805-781-2250) Can't shake your Olympics fever? Axion Spatial Imaging's \$29.95 **The Olympic Image: The First 100 Years** commemorates the art, design, and memorabilia of the Olympic Games through a varied collection of images (800-345-6665).

Hardware

The **PC Micro Presenter**, from Focus Enhancements, is a compact scan converter for displaying PC images on any TV. The \$149 device supports up to 24-bit color and is compatible with NTSC and PAL standards (617-938-8088) If you're looking for a flatbed scanner but don't want to go through the hassle of installing a SCSI card, consider Plus-tek's **OpticPro 4800P**. The \$399 240-bit, 600-dot-per-inch scanner connects to your parallel port, and includes a printer pass-through port (408-745-7111).

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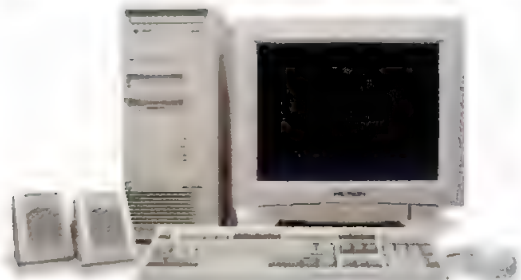
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In June 1996, Micron's Millennium P166 and Millennium P133 won two of three PC Magazine Editors' Choice awards.



Videogram for Mr. Kane!

Hey, have you seen this? Check it out, it's pretty cool." I'd stopped by ZD Labs, our corporate product-testing facility in Foster City, California, the other day. Bob Kane, the director of the facility, tossed me a box while shouldering what had to be

the world's biggest laptop bag and preparing to head out for another road trip. (Just in case you thought we were all pencil-necked geeks, Bob is a macho guy who drives a Dodge Viper and has successfully competed in the grueling One Lap Around America race several times.)

The box, labeled QuickVideo from Alaris, contained a video capture board and some software. QuickVideo captures video in the usual way, storing it as .AVI or .MOV files. The big deal here is that QuickVideo can then turn the captured file into a Videogram, a highly compressed executable file that's both video and viewer. Videograms will play themselves back on just about any Windows system, even if the user hasn't installed video extensions. You can attach Videograms to e-mails, store them at your Web site, or use them to index much larger video files.

The QuickVideo board captures 320-by-240-pixel images at up to 30 frames per second (fps). The software then turns the .AVI or .MOV file into a Videogram by compressing the audio and video and adding the player—all in a single, self-executing file.

How good is the compression? You can get a minute of video on a standard floppy disk—very good, indeed. How good is the video? Well, it looks best at 160 by 120 pixels, so obviously you're sacrificing something. But considering that a raw 15-second clip at 15 fps took 7.7MB, and that the Videogram, complete with the player, was only 369K, it's the difference between a tolerable download and a laughable waste of connect time. The 15-fps Videograms aren't as herky-jerky as you might think; motion quality is good enough to read transient expressions on people's faces, or to pan around a room with a camera. It's better at 30 fps, and the nature of the compression algorithm is such that the file is only about 110K larger, or 474K. Compression via Cinepak, Indeo, or MPEG could have reduced that 15-second raw clip to 1MB, perhaps, or a bit less, but playing it back would be a potential hassle. You'd have to ensure that the right video codec is loaded at the other end and that everything is configured properly.

I tested QuickVideo on an ultrafast Cyrix P166+, so the compression phase took only a few seconds. Even on a P90, Alaris's recommended minimum platform for creating Videograms, it shouldn't take more than a minute or two, even for 30-fps clips.

Playback is strictly no-frills. You start the .EXE file, QuickVideo profiles the display, and the clip runs. There's no progress bar, no VCR controls—just a window with video in it. I tried it on a number of systems, including e-mailing a message to myself at work using Lotus Notes' compression feature for attachments. Needless to say, Notes couldn't do much with the ultracompressed file, but it worked just fine at the other end, when I detached the file to disk. I played back Videograms on a 486DX2/66, which Alaris says is the minimum possible platform. But my results were acceptable even on a 486/33, and playback also worked reasonably well on a 486 laptop (although the 256-color LCD driver made the image look patchy and posterized). Still, you could recognize each individual, read facial expressions, and identify items of furniture in the background. Not surprisingly, the Videogram didn't work (although it tried to) on a 386/33, which simply didn't have the oomph to run the software codec, and whose on-the-motherboard VGA chip was ancient, supporting only 256 colors.

Alaris's kit is simple and functional: Video and audio cables are of a generous

length and are well thought out, with proper plugs for your video camera and your sound board. There's no need to go running off to Radio Shack to make it work. Since I already had a Sound Blaster card in the system, I anticipated conflicts between the Alaris capture card (which has microphone and line-in jacks) and the Sound Blaster, and I fully expected to spend an hour or two in device manager hell, sorting everything out. Happily, no conflicts arose.

Now I'm itching to send Videograms to friends and associates. Unfortunately, some of them use Macs, and a Mac version won't be available until later this year. But Bob will be able to see my thank-you Videogram just fine. □



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CIRCLE 113 ON READER SERVICE CARD

OS Decay: Here to Stay?

At one time or another, we've all experienced it. After installing one too many programs, your PC begins acting up or simply slows down. Weird error messages you've never seen before appear. The computer seems to be crashing a lot. When you install a new

program, the computer mysteriously tells you that it has found previously installed components—even though the components appear to have different creation dates and sizes. Do you want to keep them or overwrite them? All of these are symptoms of OS decay, and no one, not even IBM or Microsoft, seems to be doing anything about it.

The problem is compounded by a number of factors, including slipstream upgrades, monthly modifications of ancillary miniprograms, unstable DLLs, compiler changes, and Microsoft's inability to work with communications protocols, among other things. The result is that over a period of time, the operating system begins to decay, until eventually, you have to reinstall it. Here are some anecdotes from my own encounters with OS decay.

About a week ago, for no known reason, the cursor on my Pentium/166 running Windows 95 would completely disappear from the screen. If I Alt-Tabbed through all other open programs, eventually returning to the screen from which the cursor disappeared, it would reappear and everything seemed fine. Nevertheless, it's very annoying and I can't figure out what I installed that causes it.

I should add here that when you try to fix something in Windows 95, it requires an inordinate number of reboots. Whatever happened to the promise that everything would work "on-the-fly" with Windows 95? But I digress.

Then there's the weird, unreplicable phenomena. For example, on the Cyrix P166+ preinstalled with Win 95, the little menu bar at the bottom of the screen, when set to "Auto hide," slides up with a smooth scrolling motion that looks ultra cool. On all the other systems I've seen, it pops up. I haven't been able to find anyone who knows how to duplicate this and I suspect it's caused by a slipstream upgrade or something embedded in another application.

A slipstream upgrade, for those of you who haven't heard the term before, refers to a "minor" upgrade—typically a code adjustment or minor bug fix—not worth announcing. In fact, it usually requires a recompile of all the

code and, in so doing, it can create entirely new bugs. This practice accounts for the phenomenon of the exact same machines working differently with what is supposedly the exact same software.

Another Win 95 problem that has rooted itself in my Pentium/166 involves the COM-port handler. After any session using a COM program, if I want to run AOL I have to initialize the program and attempt to make a connection, then reboot the session. Curiously, the session reboot takes forever and the AOL screen just hangs there for a couple of minutes before disappearing. Afterwards, AOL works fine. Well, most of the time anyway. A couple of week ago when I went through this process, I got two Windows error messages in a row. On the third attempt, AOL appeared to run fine. Eventually, this error stopped happening—for no known reason.

I should also mention that the OS/2 quirks are no less loopy. While OS/2 does not crash as routinely as Win 95, it does crash. And its communications sessions, though typically smoother than those of Win 95, do have some screwy problems, especially with OS/2 Warp Connect. With the configuration I had, if I switched between active programs at full-screen setting, Connect would lose all keyboard control. And OS/2 has the decay problem in which, after loading a number of programs, certain utilities begin to overwrite other versions to the

point where some programs stop running.

I believe that this latter problem, especially with Win 95 DLLs and programs such as QuickTime for Windows (a total headache), needs to be addressed and corrected immediately. There should be either an OS management-type program that can handle multiple DLLs or a database of DLLs and associated programs that are changed from one install to the next, coupled with a utility that can archive programs to be overwritten. Finally, vendors should strive to make operating systems less dependent on overlays, DLLs, and other tricks by putting more functionality into the kernel. □



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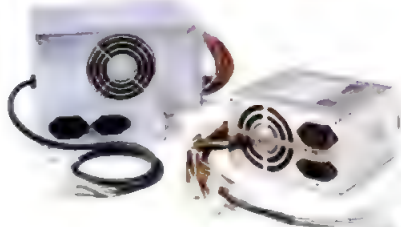
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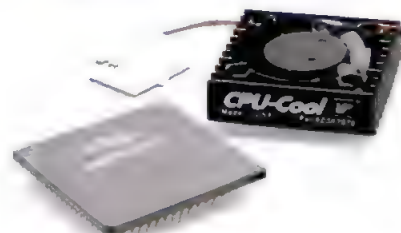
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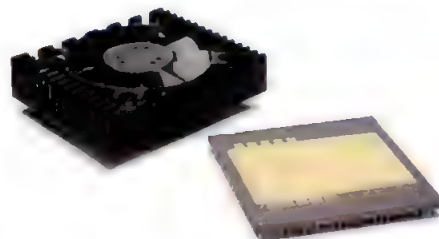
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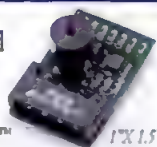
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CIRCLE 080 ON READER SERVICE CARD

Inside Track

Will Microsoft buy Apple? That's the first thing that came to mind after reading an interview with Bill Gates in Silicon Valley's *San Jose Mercury News*. In the interview, Gates seemed **preoccupied with Apple's R&D budget** and how its developments were not being exploited. More interesting was the recent appearance, at Microsoft's Redmond campus, of new Apple CEO Gil Amelio. And the *Mercury News* reports that Gates will be speaking at an upcoming Apple management retreat. Things certainly seem a little too cozy.

Gates would **love to take control of the company** that was **begun by his nemesis**, Steve Jobs. And a takeover would give Microsoft a number of strategic opportunities. Microsoft has got to find a way to keep growing; its employee incentive program is based on growth, after all. Buying up other companies is one way to do this. Apple poses a threat to IBM and Sun Microsystems in an area in which Microsoft can't compete: hardware.

IBM recently licensed the Mac OS, while Microsoft is trying to make Windows NT the universal portable OS. At first, the only target for Windows NT was Unix, but now the Mac OS has become a problem. The recently announced delay in Copland, the next generation Mac OS, may have something to do with Gates looking into buying Apple: It's in his best interest that the new OS never ships. **Sun Microsystems is another target**, because top networking folks view its UltraSparc as the number one Internet server. The UltraSparc runs Unix efficiently and most site managers believe it's the most reliable Web server you can buy (although this point is hotly debated). It would take little effort to **move Apple in this direction**.

Apple has also subscribed to the notion of the network computer (NC), perceived by many—though not by me—as a serious threat to Microsoft. Gates is still a little gun-shy over the fact that Microsoft **missed the Internet phenomenon by two years**, and Microsoft is not going to take anything for granted.

The **PowerPC** has sort of **stopped short of expectations**, or so it seems. It's possible that everyone is holding back because something phenomenal is about to hit the streets. There may be something in the Apple R & D lab. Maybe Gates already knows what that product is and sees Apple as ripe for a turnaround. Something worth buying the company to get hold of. Whatever the case, **something fishy is going on**.

Obviously, Gates gets secret heads-up briefings regarding the new technological developments at many companies. In the *Mercury News*, for example, he discussed some **phenomenal HP printers** that are in the pipe-

Gates would love to take control of the company that was begun by his nemesis, Steve Jobs. And a takeover would give Microsoft a number of strategic opportunities.

line. I assume this means smaller, cheaper, better color printers. While it's well known that Gates has his hooks deep in Intel design, he must also have a decent relationship with Motorola, since he knows what they plan to do with MMX.

Upping the Ante Dept.: Congratulations to ViewSonic for rolling out a 21-inch monitor that does **1,800- by 1,440-pixel** resolution. According to the company, it's the first time a monitor has actually outpaced a graphics card. At the time of its release, **no graphics card could actually drive the thing** at that high resolution. Kind

of makes you wonder how they know it works.

More Good News for Geeks Dept.: The new Timex/Microsoft geek watch has just shipped. Looks like they finally dropped the cheap plastic band. New features include more memory and the ability to load external apps. Probably **worn by more billionaires** (three, maybe) than any other single watch.

Kicking Sand in the Big Guy's Face Dept.: For some time now, a battle has been brewing regarding the use of Internet phone products to make long-distance calls over the Net. As impractical as it is for everyday use, this technology does have some appeal, especially for **cheap Net users** looking to get something for nothing. The whining phone companies see this as a real threat to their business, and they have appealed to the FCC to stop the trend. Last June, a huge consortium of Netizens, vested interests, and software companies—calling themselves the Voice On the Net (VON) Coalition—filed a joint reply to the telco action.

I wonder if the VON Coalition's tactic is going to work. Instead of emphasizing the fact that these Internet phones have **zero impact** on real long-distance services and, in fact, are not competitive at all, the coalition chose to do the **Internet Should Not Be Regulated rant**. Obviously, telling professional regulators that something should not be regulated is suicide. It will probably result in a study showing that the Internet does need regulation for some bogus reason. In fact, this whole issue should be dropped until it is actually proven to be a problem for the phone companies. Right now, it's all **theory and projections**.

My concern is that the VON Coalition—types will annoy the telcos so much that the companies will **choke off bandwidth**—something I'm convinced will happen eventually anyway. By bouncing packet-switched data around their systems in creative ways, the telcos could make real-time use of the Net a nightmare. If that doesn't work, maybe changing all tariffs to a per-minute charge (rather than monthly fees) would send the Internet community a nice, **costly** message. □

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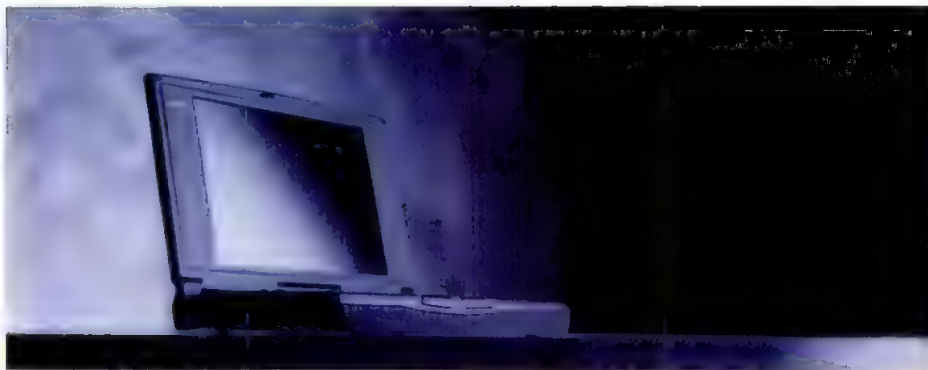
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CIRCLE 087 ON READER SERVICE CARD

Of Football Pools and More

Well, Mr. Big-Time Columnist, you've really done it. In my office, we now think of you as 'The Grinch Who Stole ESPN.' It was a witty close to an e-mail that was more than a little unusual, at once funny and seriously angry. My correspondent wrote

to complain about what he saw as fallout from a column I'd written several months ago. I had reminded business-PC users that as much as they think of the PCs they use as literally *theirs*, those gray boxes really belong to their employers—as does the prerogative of setting the rules for PC usage. As we've seen in many offices, those rules include limits on accessing non-work-related Web sites.

The writer—I'll call him Bob—explained that in his office, following several games at once on ESPNet (<http://espnet.sportszone.com/>) had quickly become the norm, once everyone had Netscape and access to the Web via the company's LAN. Office betting pools formed and produced winners daily. It was, Bob said, almost like bringing Saturday afternoons into the office: "The guys loved it."

Then, without telling anyone, the company started monitoring URL accesses. Before long, a memo came down From On High to the effect that Web access was strictly for business use: Anyone found "conducting personal business on the Web over the company network during working hours" would be "dealt with." Bob, like many of his coworkers, was angry. He called a friend in IS, who got back to him a day later with the word that in the first month of monitoring, almost 40 percent of the company's Web use had been on ESPNet SportsZone. When management saw that report, they blew up; the no-no memo soon followed.

And worse yet: Access to ESPNet and a few other favorite sites was flat cut off.

"I can understand their attitude," Bob wrote, "but I don't like it. It's like break time. What we do ought to be our own business, as long as we get our work done. This stinks. And you encouraged them. So, in my office, we now think of you as 'The Grinch Who Stole ESPN.'"

Part of me is always perversely flattered when readers suggest that this column has such a long lever. Then my head returns to normal size, and I realize how silly—flattering, but still silly—are those readers' claims for my omnipotence.

The chance that Bob's Web access to sports scores was cut off because of anything I wrote is small. A far likelier culprit—and he knows it—is that stunning 40-percent-of-Web-use figure.

Actually, I've been an opponent of blindly locking workers out of Web sites. Just as employers have to trust their employees' discretion in the use of time and company resources for business purposes, in the end, supervisors will find they have to trust their employees' discretion in using online resources as well. Still, there are middle grounds where both interests are served.

Make that *all* interests, because this isn't just a matter of bosses versus oppressed hordes. IS managers are scared to death about widespread, prolific, and repeated use of the Web to access *any* site, legitimate or not. IS managers see themselves as Guardians of the Holy Bandwidth, and in their zeal to conserve LAN bandwidth (important and laudable) and T1/T3 data-comm bandwidth (equally important and laudable), they flinch at the sight of big spikes in traffic. Turn those spikes into new, persistent plateaus of bandwidth use, and IS managers become apoplectic. You may think that that's unnecessary—maybe even funny. But you won't think it's either when your network slows to a crawl. Or when you can't grab time on that T1 link.

The most obvious answer, and a good one, is the proxy server—in effect,

a giant cache of the current or almost-current states of the most commonly accessed Web sites and pages. IS posts a list of the sites to be cached and the frequency with which the cache for each site is to be updated. Then, when Bob clicks on a popular bookmark in his browser's hot list, the call to that URL is intercepted by the proxy server. It looks in its (often-massive) disk cache to see if the page is there. If so, the data zips back to the user about as fast or faster than if he'd been connected directly to the distant Web site. Thus, while there is a brief increase in LAN traffic to service the request, there is no demand on the company's T1 (or other) phone-line access.



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JIM SEYMOUR

(Note that should the request drill down deeper into a site than the proxy server's cache spec accommodates, the call to that URL would be passed out through the firewall, and the employee would get a direct connection to that site. IS must have sufficient items in that proxy spec to service most recurring requests from the cache, or the proxy server will do little to reduce system traffic.)

When using a proxy server, it's also possible to restrict access to a list of specific Web sites. This may serve the interests of companies concerned not only about maintaining workers' productivity but also about possible legal entanglements—as when, for example, employees try to access Web sex sites, the consequences of which can include sexual-harassment litigation by aggrieved employees and serious image problems (“Suit Claims Acme Insurance Home Office Hot-bed of Online Sex Play”).

Some smart online sources encourage this proxy-server approach. For example, the PointCast Network, which I've written about here (“PointCasting the Future,” June 25, 1996), recognizes that employers and IS managers are wary—to put it mildly—of hundreds or thousands of employees pinging PointCast's servers all day long for news updates. So the PointCast software resident on your PC includes a setup for accessing the service through your company's resident proxy servers. And PointCast is developing a proxy-server-resident package that will let companies add their own company-specific information to the data available from PointCast screens.

A carrot works better than a stick, and not only from an online service's side of the street. Intelligent compromises and accommodations of workers' legitimate interests can make office life easier and less contentious. If a proxy server refreshing its cache frequently can avoid losing large chunks of LAN and data-comm bandwidth, it may be possible to allow limited access to select, non-work-related Web sites.

As I said in that earlier column, monitoring and managing online usage is a dilemma for managers. If a company doesn't allow its employees to sit and read *The Daily News* for half an hour or more each day, will it—should it—allow time to read similar material online? Are employees in effect time-shifting their news-reading patterns from early-morning and late-evening time of their own to their employers' time? Is American business going to accept this new cost category? □

New SOHO Solutions

Back in high school, my yearbook advisor gave me a warning: I was spending altogether too much time building Heathkits, taking and developing pictures, and tinkering with cars—and not enough on academics and the school publications. If I wanted to get

ahead in journalism, he advised me, it was time to shape up. “After all,” he said, “What are the chances somebody’s going to pay you good money to fool around with electronics when you’re an adult?” Hmm...well, years later, I’m still fooling around with electronics. Here’s a rundown of the handful of recent products I’ve seen, tinkered with, and liked.

SoloCall, a paperback-size gray box, provides call management for four devices—typically a two-line telephone, a modem, a fax machine, and an answering machine—connected to two phone lines. Think of it as a one-room PBX. The \$495 (list) SoloCall, from startup SoloPoint (408-364-8850; <http://www.solopoint.com>), figures out which incoming calls go to which devices. SoloCall automatically switches your outbound modem or fax transmissions to the other line if the assigned line is in use. Important calls can be forwarded to another telephone off site (even a cellular phone) if no one answers; the same pass-code system lets priority calls ring through after hours. SoloCall has virtually every bell and whistle you could want: caller ID, distinctive-ring switching, fax recognition, three-way calling, call logging for client billing, voice mail monitoring, and the ability to customize answering options based on the time and day.

If you set up SoloCall using the defaults, you’ll be up and running in a few minutes. I found the custom setup frustrating, however—the high-tech equivalent of assembling a kid’s toy on Christmas Eve: “Insert slot A into tab B of bolt retainer clip (Fig. 14).” You can program SoloCall from your phone and run it as a standalone device, but it works best attached to your PC via the serial port. (This is another product that will benefit immensely from a Universal Serial Bus interface.) At \$249 or even \$299, I think SoloCall would be a smash hit on the order of Visioneer’s PaperPort personal scanner.

Desk space is an issue for most home or small business offices, so a combination ink jet printer/fax machine makes a lot of sense. Until recently, however, none of these multifunction devices offered true, four-color ink jet printing. But we now have a successful fusion of the two technologies: the

Canon MultiPass C2500 “document processing system”—a fancy way of saying a combination BJC-4100 four-color printer and easy-to-use fax machine. With a street price of \$600, it’s the about the same as—or even as much as a hundred dollars cheaper than—what you’d pay for a BJC-4100 and a separate entry-level, plain-paper fax.

As a standalone fax machine, it’s a reliable, idiotproof device with big buttons. You can send paperless faxes from your PC via the printer port, and it also has a 200-dot-per-inch convenience copier and black-and-white scanner. This would be a killer device with a higher-res color scanner and Visioneer PaperPort software (800-848-4123; <http://www.ccsi.canon.com>). (Panasonic markets a similar device, the KX-F1600, for a list price of \$750.)

Here’s a simple solution to the problem of transformer bricks too bulky to plug side-by-side into standard power strips. American Power Conversion makes a heavy-duty, foot-long AC power-cable extender, intended for use with its Power-Director switching unit but helpful with any device. Dealers are unlikely to carry it, so call APC directly (800-877-4080; <http://www.apcc.com>) and ask for part number CAP 9506 (\$4.95). APC also has a 250 volt-amp UPS, the BackUPS Office (\$159 street price), that has two of its six outlets spaced far enough apart to accommodate transformer bricks. One note of caution: It won’t work with PCs that draw more power than a Pentium/133 would.

Music-loving, laptop-toting road warriors

who spend a lot of time on airplanes will benefit from noise-canceling headphones from Sony. They do a fabulous job of knocking out the persistent drone of jet engines, so you arrive at your destination feeling less fatigued. The music quality is pretty good, too—as it should be for a device with a list price of \$199.95. The headphones come in two models: The MDR-NC20 is a comfortable, folding-earmuff style, and the MDR-NC10 fits in the ear, doing a better job of sealing out noise. The headphones can run for 40 hours on a single AAA battery. Good luck getting your company to buy you a pair—although the peace and quiet are definitely worth it (800-222-7669; <http://www.sony.com>). □



GREAT GADGETS

Here’s a
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with, and liked.



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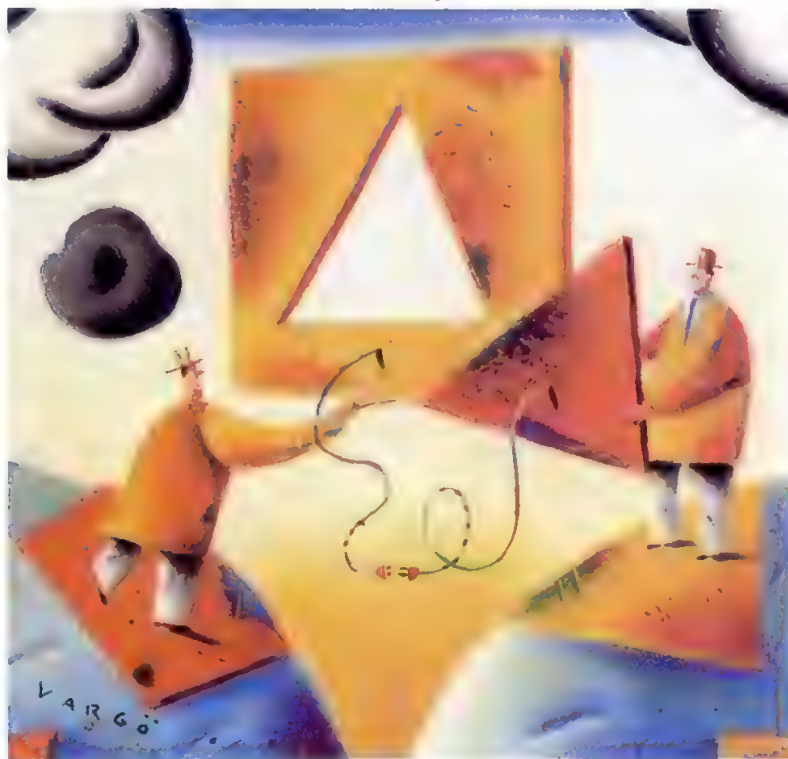
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NETWORK EDITION

REMOTE-NODE SERVERS

A Node from Afar

More than ever, remote-node servers are a great choice for providing users with remote access to your network.



By Steve Rigney

If you've ever had to trudge into the office on a sunny Saturday to print out a copy of a spreadsheet you promised to peruse over the weekend or if your salespeople on the road ever have to call in to check the status of an order, your office is a prime candidate for a remote-node server.

Though remote control is now the most common method of remote access, remote node will become more predominant as connection speeds increase and people

INSIDE



The remarkable adoption rate of remote-access solutions makes me wonder what's next for staying connected over long distances. Around here,

we joke about chip implants for enabling mental telepathy. That doesn't seem too farfetched to me. (Maybe I'm reading too much Dale Brown.) Anyway, it's hard to imagine doing business without connecting remotely to your desktop, e-mail, online services, or something else.

TODAY YOU FOCUS on the services your users need and on how you want to set up the remote access. In this issue of *PC Magazine*, we review the year's crop of remote-control software packages (see "Friendly Takeover"). Here in Network Edition we review the complementary technology: remote-node servers. Remote expert and contributing editor Steve Rigney takes the lead in covering the subject.

WE ROUNDED UP the usual suspects and observed that things are moving right along. That is, nearly all vendors are steadily improving connection options—ISDN is a must now—and ease of use. Shiva, 3Com, and Microcom continue to set the pace. With ISDN well established in these products, you have more reason than ever to jump into that market, if you haven't already.

IN FIRST LOOKS, technical analyst supreme Russ Iwanchuk reviews the hot, new low-end Cisco 1004 ISDN router, with EZ Setup software. EZ Setup really lives up to its name, says Iwanchuk. It is an HTML-based package that Cisco plans to make available with other routers in the same line. In addition, Rigney reports on new releases of two network management packages: Intel's LANdesk Management Suite 2.5 and CapaCity's NetCon 3.0. (Page NE21.)

—Gail Shaffer

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use the Internet to conduct business. Remote node differs from remote control in that it uses a standard analog phone line or digital ISDN high-speed link to extend network cable to any destination in the world. While on the road, you can use your notebook to view all the drive letters and printer names you have when you're connected to the LAN. Unfortunately, the dial-up connection is a lot slower than a 10-Mbps direct Ethernet link even at 128-Kbps ISDN speeds. This makes remote node useful for applications that don't require the transmission of a lot of data, such as accessing client/server databases, e-mail, or the Web.

Instead of acting as an extension of the network cable, remote control extends your keyboard, video, and mouse connections (for more information, see "The Art of Remote Access," August, 1995). Because you are only sending keystroke and screen information, remote control is speedy. The connection, however, is not interactive.

THE PRODUCTS

We set out to find the most popular hardware-based remote-node servers on the market. Digital Equipment Corp. and Xylogics chose not to be in the roundup because they are working on new versions. We eliminated software-only solutions like Novell's NetWare Connect and Stampede Technologies' Remote Office, because we wanted to focus on products that both an experienced network administrator and a novice Internet service provider (ISP) could easily install and use without having to build a server. This left six products that not only allow you to connect using the PPP dial-up client built into Microsoft Windows 95 but are simultaneously compatible with the TCP/IP and IPX protocols.

INSTALLATION

Fortunately most of the vendors in this roundup provide easy-to-use utilities to help you with the installation process. Products like the LanRover/Plus, LANexpress, and AccessBuilder 2000 provide graphical Windows-based utilities that automatically detect the server and set up all the security, ports, and protocols with the click of a mouse. The RLN server is slightly more difficult. The Cisco 2509 and Whittaker Xyplex Network 3000 require you to use a dumb terminal and cryptic commands to configure the unit.

Even with fairly specific review criteria, the products showed up in all shapes and sizes with varying capabilities. Half of the products, including the Microcom LANexpress 4000, the Shiva LanRover/Plus, and

Shiva LanRover/Plus 4.0

Boasting features suitable for either a large ISP or a small LAN, Shiva's LanRover/Plus 4.0 garners

our Editors' Choice. Though some products in our roundup are housed in unwieldy PC-size enclosures, the petite LanRover (\$8,999 with eight internal V.34 modems; \$7,119 with four ISDN BRI adapters) can be mounted in a 19-inch rack.

Installation and management are easy with the Shiva Network Manager (SNM) software, which works with almost every OS on the market and offers comprehensive management and statistical information.

The LanRover/Plus's scalability put it

over the top for Editors' Choice. It's a good solution for analog connections, and ISDN support can be added as the need arises.

The 3Com AccessBuilder 2000 (\$3,985 list for tested configuration) wins an honorable mention. Its easy installation, simple configuration, and competitive pricing makes the AccessBuilder a very attractive product. It provides eight asynchronous ports with dial-up capability, LAN-to-LAN routing, and bandwidth on demand.



the Attachmate RLN Access Server, came with internal V.34 modems. The other three provided only high-speed serial ports. Some of the products, such as the LanRover/Plus and the AccessBuilder 2000, come in a slim-line rack-mountable chassis so you can easily add devices as your needs expand. Others, such as the LANexpress and the RLN, are housed in full-size PC cases that take up a lot of space.

SECURITY AND MANAGEMENT

As more businesses, particularly ISPs, open their modem ports to the public, security and management will continue to grow in importance. All of the products in this roundup provide basic user names, passwords, and dial-back security.

Most of the products also work with the CHAP (Challenge Handshake Authentication Protocol) and PAP (Password Authentication Protocol) specifications that provide additional security. Products like the Cisco 2509 and the RLN also work with third-party security servers including TACACS (Terminal Access Controller Access Control System). These systems are expensive and require a dedicated security server.

Another way to protect your resources is to limit access according to time of day or even network protocols. For example, the LanRover/Plus can allow users to access the server only using the IPX protocol, so they can't surf the Internet via the company's expensive T1 link. RLN's call accounting system will keep track of how long users have been connected and how much data they transfer. This allows you to bill users for access or just monitor their usage.

All the products in this roundup provide

some type of management that allows you to see if a port is operational and in use. Products like the LANexpress even give statistics on the quality of the dial-up telephone line. You can also check for failed connection attempts, network packet errors, and the speed of connection. The way this information is presented is also important. The AccessBuilder provides nice graphs, but the Cisco 2509 requires you to use a character-based terminal to view the statistics. Fortunately, most of the products work with SNMP, so you can use a third-party management platform to provide graphical remote management.

FASTER CONNECTIONS

Two products in our roundup, the LanRover/Plus and LANexpress, come with a choice of either internal ISDN adapters or analog modems. ISDN provides faster throughput and reconnect times, and it's ideal for the stationary telecommuter. The LANexpress can provide only a single-channel 64-Kbps ISDN connection, but the LanRover/Plus works with the MP (Multilink PPP) specification, which can aggregate two channels for a 128-Kbps connection. At this speed you may even be able to run small applications across the link.

OTHER FEATURES

Some of the more exciting but often overlooked features of these products include dial-out and LAN-to-LAN routing. Although most of the products in this roundup allow you to dial out across the network, only a handful offer LAN-to-LAN routing. For example, you can use two LanRovers or two AccessBuilders to

Band-
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ATM
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But it
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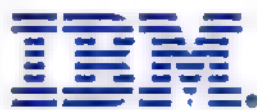


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establish a connection between two remote networks. Because both products work with ISDN and provide bandwidth aggregation, you can use them to establish LAN-to-LAN connections faster than 128.8 Kbps. This could be a less expensive solution than a dedicated leased line, especially if you don't need the link up all the time. By the time you read this, U.S. Robotics will have released the NETserver/8, aggressively priced at \$4,495, with PPP support and a new auto-configuration wizard.

With a few exceptions, remote-node server solutions continue to improve each year. You'll want to look for one that's easy to install and manage, that offers the right protocols, and that can handle your remote-access traffic. You may even decide to mix and match products. A careful look at our analysis of the products should help you pick the remote-node server that is best for you.

Attachmate Corp.

RLN Access Server

ALL REVIEWS BY STEVE RIGNEY

RLN (Remote LAN Node) started life as a software-only remote-node server but has evolved into the turnkey solution known as RLN Access Server 4.1 (\$7,595 for both the hardware and software). Attachmate's engineers created the server using a standard desktop PC (in this case, a Dell OptiPlex XM575), installing an 8-port Xircom Multi-port Modem Card,

and configuring the RLN software. Though it lagged behind in our performance tests, the RLN Access Server is fairly easy to install and offers excellent management and call logging features, and strong security.

Before we could turn on our server, we had to use a separate client PC to configure the RLN boot disk. This step required naming the server and deciding which protocols to use. After starting the server with the boot disk, we had the option of using the RLN graphical manager to complete configuration, including setting up user names, protocols, and security. We hit a snag when we tried to change the Xircom modem's port speed to 115.2 Kbps. The modem remained stuck at 57.6 Kbps.

Attachmate gives you several options for connecting to the server once everything is configured. You can use the bundled RLN client software for DOS, OS/2, Windows 3.x, and Windows 95. Although we did install and test the RLN Windows 95 client software, we used Windows 95's built-in Dial-Up Networking utility for our benchmark tests. However, the RLN Windows 95 client offers extra features such as multiple phone books and a terminal emulator.

In addition to basic management features like monitoring network traffic and port usage, RLN adds a unique feature called Advanced Call Accounting. This Microsoft Access-based utility logs RLN

session information into an access database. You can use Call Accounting to audit your remote RLN users based on the duration of the call or the amount of data sent or received. You can also view a report of port utilization to see if you need to add more servers. This is a great utility if you need to keep track of remote usage for billing information.

RLN scored last in our performance tests and was particularly slow with compressible files. According to Attachmate, RLN encounters PPP errors using the Windows 95 Dial-Up Networking utility to connect to the server. Attachmate representatives say it will be fixed in a later release this summer. We tried the same tests with Attachmate's RLN Windows 95 dial-up PPP client but didn't see any noticeable difference.

The great advantage of RLN is that because it is primarily a software solution, you can build almost any remote-node server you want. For example, you could configure a RLN server with modems, ISDN cards, or even X.25 adapters. And the software is probably the most flexible solution on the market. Despite its considerable size and low performance numbers, the RLN Access Server is a solid turnkey solution.

RLN Access Server 4.1. List price: For tested configuration, \$7,595. Attachmate Corp., Bellevue, WA; 800-426-6283, 206-644-4010; <http://www.attachmate.com>. Circle 951 on reader service card.

A Letter to the Editor

Dear Editor,

While we at Olicom were honored to receive your Editors' Choice award ("ATM on the Move," April 23, 1996) for our RapidFire ATM 155 PCI adapter, we feel the performance results published in the article require further interpretation. The results of your tests for our adapter showed 12 Mbps for one client and 19.7 Mbps for two clients, far below the theoretical maximum. We contend that the reason your tests showed less-than-expected results was that you did not saturate the measured adapter with enough traffic. By using only one or two clients and the copy command to transfer a file from server to client(s), not enough data was sent through the measured adapter (in the server) to determine maximum throughput. What's more, the copy command uses a serial method of transferring data that in effect causes the server to wait for the client at several points while transferring the file. This latency also contributed to your results.

To put the results of your tests into perspective, we replicated the PC Magazine test using Fast Ethernet. The result was 9 Mbps for one client and 16 Mbps for two clients. The performance of Fast Ethernet is well documented to be 60 to 80 Mbps or more, thus showing your test method was inadequate for test-

ing adapter throughput. Furthermore, when we tested our RapidFire adapter using an industry standard method, our results showed adapter throughput up to 110 Mbps for Ethernet LAN emulation and 129 Mbps for Token-Ring LAN emulation. We invite PC Magazine readers to get the full description of how we conducted our test by visiting our Web site at <http://www.olicom.com>.

Sincerely,

TOMASZ J. GOLDMAN

Director of System Engineering, Olicom
e-mail: tjg@olicom.dk

Our tests were aimed at showing how 155-Mbps ATM adapters perform using Windows NT File Manager copies and LAN emulation. We did not intend these results to be compared with other fast networking products, but we regret not publishing results for Fast Ethernet adapters in the roundup to establish some context.

In some additional testing referred to on page NE13, we found that adding more clients did not increase the aggregate throughput of the server adapter and that the server was indeed saturated. We found the CPU utilization to be near 100%, and we attribute this to the overhead of the File Manager copies and the Ethernet MTU size of 1.5K.



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PERFORMANCE TESTS

Remote-Node Servers



Because modem rate is usually a constant, we focused on the performance of the compression algorithm for our six remote-node servers. The LanRover led the pack on the highly compressible file tests, with the LANexpress a close second.

What the Numbers Mean

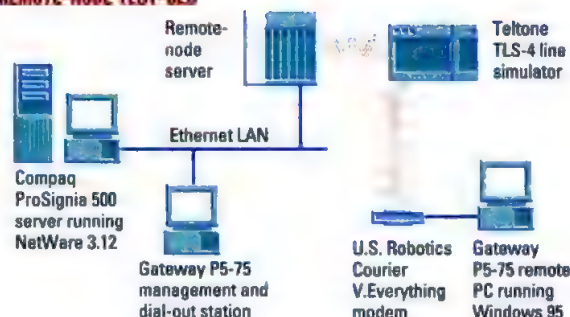
Our test files ranged from highly compressible graphics files to noncompressible executable files. LanRover, which uses Stac's LZ compression, provided the best performance on the highly compressible file test. Because Attachmate's RLN software was not able to compress the file, transfer times were slower. All products had similar throughput on the less-compressible files. A fast built-in modem or serial port is crucial, but a good compression scheme can be just as important depending on the remote tasks you do. —Analysis written by Steve Rigney

How We Tested

We tried to test these products in ways that reflect how they're used on real LANs. We also wanted to gauge their ability to work on the business end of an Internet service provider (ISP).

Networks are increasingly using multiple protocols. The IPX protocol, now a part of both NetWare and Windows NT, is the most common. Many administrators, however, are adding TCP/IP to service intranet Web servers and perhaps to provide corporate Internet access. Of course, IP is what ISPs need. We

REMOTE-NODE TEST-BED



connected to our remote-node servers using both protocols and evaluated the management reports and services they provide.

With these scenarios in mind, we set up each remote-node server on an Ethernet LAN with a server running NetWare 3.12. One networked PC acted as a management console and as a client for any network dial-out features that the products included. We installed both IPX and TCP/IP on our test network. We used Windows 95 on our remote PC, and we configured both the IPX and TCP/IP protocols for our dial-up adapter driver. We used U.S. Robotics Courier V. Everything modems for the client and access servers without modems. A Teltone TLS-4 line simulator provided consistent connections.

We established a remote-node connection to the NetWare server and downloaded five different files using the Windows 95 Explorer copy command. We downloaded each file at least three times and reestablished the connection between each copy to eliminate outside factors such as a bad modem link. We also set both the remote and host modems to a data rate of 115.2 Kbps on the serial port side.

Remote File Transfer

Minutes:seconds	Highly compressible file (7.7:1 ratio)	Moderately compressible file (2.5:1 ratio)	Slightly compressible file (1.3:1 ratio)	Noncompressible file (1:1 ratio)
Attachmate RLN Access Server 4.1	8:23	2:10	1:21	0:53
Cisco Access Server 2509	2:02	0:49	0:48	0:46
Microcom LANexpress 4000	1:53	0:48	0:47	0:45
Shiva LanRover/Plus 4.0	1:48	0:53	0:53	0:53
3Com AccessBuilder 2000	2:15	0:52	0:49	0:48
Whittaker Xyplex Network 3000 Remote Access Router	1:57	0:49	0:49	0:52

◀ BETTER

◀ BETTER

◀ BETTER

◀ BETTER

Cisco Systems Inc.

Cisco Access Server 2509

Like Whittaker Xyplex's Network 3000 line, the Cisco 2500 series of remote access servers is powerful but confusing to install. We looked at the Cisco Access Server 2509, a unit that has not really changed since our last review of remote-node servers ("The Art of Being Remote," August, 1995).

The Access Server 2509 includes eight asynchronous serial ports and is available in two versions. The basic Access Server 2509 package (\$3,545) works only with the IPX and TCP/IP protocols. The Enterprise version (\$5,405 with Stampede's Remote Office dial-in software) is available for IPX, TCP/IP, AppleTalk, DECnet, and XNS protocols.

The first thing we noticed when we unpacked the Access Server 2509 was the

lack of a basic installation manual. In place of a manual was the UniverCD CD-ROM, which contains installation, management, and Cisco product information stored in HTML format (fortunately the Verity Mosaic Web browser comes included). UniverCD is a unique concept, but it did not make installing the product any easier. UniverCD runs on Macs as well as Unix and Windows-based PCs.

In order to configure the server you



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HAWK 2XL	ST31051	1.050 GB	SCSI-3, 8/16 bit	up to 20 MB/sec	5411	9/10.5
HAWK 2XL	ST32155	2.147 GB	Ultra SCSI 8/16 bit	up to 40 MB/sec	5411	9/10.5
HAWK 2XL	ST31055	1.050 GB	Ultra SCSI 8/16 bit	up to 40 MB/sec	5411	9/10.5

Seagate

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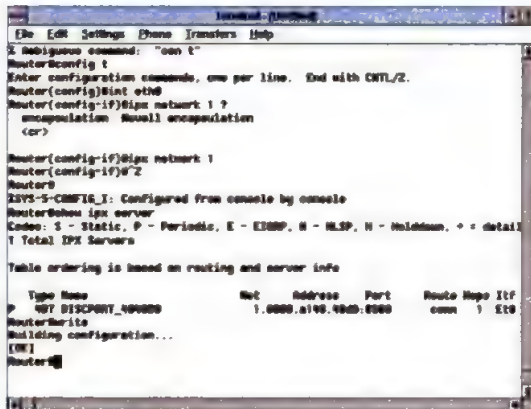
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must use a terminal and cryptic IOS (Internetworking Operating System) software commands. Almost all of Cisco's routers run IOS, so if you currently have any Cisco products you may already know some of the basics. We had problems configuring the unit because some of the HTML documents were out



ACCESS SERVER 2509: You need to use a terminal and IOS commands for manual configuration.

of order, hindering our ability to keep up with terminal queries. A call to technical support saved the day.

The Access Server 2509 provides different levels of error logs, ranging from the occasional packet error to serious lost connections. Though all of the management logs and reports are impressive, the product requires that you use the terminal to view them. Cisco offers an optional SNMP-based management utility called CiscoWorks. A more graphical alternative is HP OpenView.

Despite obvious setup and configuration difficulties, we were impressed with the Access Server 2509's performance and durability. We were able to reconnect to the server within seconds of resetting the power. In addition, the unit has call-back and connection limits and the ability to dial out across the network if you are running the TCP/IP protocol.

The Access Server 2509 impressed us with its ability to use asynchronous serial ports in place of the traditional synchronous WAN links. But unless you want to learn hundreds of complicated commands, and search through countless Web pages for error messages and documentation, you should probably look elsewhere for your remote-node solution.

Cisco Access Server 2509. List price: For tested configuration, \$3,545. Cisco Systems Inc., San Jose, CA; 408-526-4000; <http://www.cisco.com>. Circle 952 on reader service card.

Microcom Inc.

LANexpress 4000

Though it looks like a full-size desktop PC, Microcom's LANexpress 4000 Version 4.0 (\$5,190, with one ISDN adapter and a dual V.34 modem adapter) is really a powerful remote-node server housed in a standard PC case. Available in custom-configured combinations of internal V.34 modems or ISDN BRI adapters, LANexpress 4000 offers a wide range of configuration options. An extensive array of management software and features, such as bundled remote-control software and dial-in/dial-out capabilities, makes the product even more attractive. LANexpress 4000's biggest flaw is that it currently doesn't work with the Multilink PPP specification, so your ISDN connections are limited to 64 Kbps.

Like the AccessBuilder and the LanRover remote-node servers, the LANexpress only requires about 30 minutes to set up and configure. After you connect all of the cables, the server will automatically determine the number of modems or ISDN adapters installed in your system and the type of Ethernet frame you are using.

After setup, you can use the Windows-based expressWatch software to configure network protocols and activate security. The utility also provides a great interface for monitoring remote users. You can choose from several different views for monitoring network packets, network errors, connection speeds, and even the quality of the dial-up phone line. The Snapshot utility allows you to save a picture of your monitoring charts for future reference.

Along with Microcom's Carbon Copy remote-control software, the LANexpress comes with dial-in software for DOS, Windows 3.x, and Windows 95. It also includes a terminal emulator for calling online services. Though the LANexpress Windows 95 client offers a nice interface, using the built-in PPP dial-up utility in Windows is just as convenient and fast. Using Windows 95's dial-up adapter client software, the LANexpress provided the fastest overall file-transfer performance of any product in this roundup. The product also works with the ARAP (AppleTalk Remote Access Protocol), IPX, NetBEUI, and TCP/IP protocols to allow you to access almost any host network. The package allows you to

dial out across the network from any DOS- or Windows-based client PC.

Unfortunately, the LANexpress is missing features that some LAN administrators find essential. Unlike the LanRover, the LANexpress doesn't possess dynamic bandwidth allocation or the ability to establish LAN-to-LAN connections between two LANexpress servers.

LANexpress's ease of installation and powerful management software make it an ideal solution for small to medium-size networks that need to add a remote-node/remote-control server. LANexpress boasted impressive Asynchronous Modem test results, but it might not be fast enough for the true power user. The large chassis hinders LANexpress 4000's attractiveness to large remote-node locations such as ISPs.

LANexpress 4000 Version 4.0. List price: For tested configuration, \$5,190. Microcom Inc., Norwood, MA; 800-822-8224, 617-551-1000; <http://www.microcom.com>. Circle 593 on reader service card.

Shiva Corp.

LanRover/Plus



Shiva has been doing remote node for a long time and continues to churn out better and better products. Despite some management software/protocol incompatibility issues, the LanRover/Plus 4.0 (\$8,999 with eight internal 28.8 Kbps V.34 modems; \$7,119 with four ISDN BRI adapters) is no exception. With easy installation and configurability, it can manage your bandwidth to save money and provides dial-in, dial-out, and LAN-to-LAN connectivity using IPX, NetBEUI, and TCP/IP network protocols.

Housed in a chassis slim enough for a 19-inch rack or a cluttered wiring closet, the LanRover offers a minimalist installation procedure as well. Simply connect the network cable, phone line, and AC power cord and install the Shiva Network Manager (SNM) software.

The SNM software, which is similar to 3Com's Transcend AccessBuilder Manager in offering extensive management and statistical information, runs on any Macintosh or DOS or Windows-based PC. In addition, it automatically finds the LanRover and allows you to configure users, ports, protocols, and connection methods. The LanRover also includes an SNMP agent if you want to manage the unit using a third-party package, such as HP OpenView.

Unfortunately, the SNM utility will not

work if you have the IPX protocol bound to a dial-up adapter on a PC running Windows 95. To solve this problem, we had to remove the protocol from the Windows 95 dial-up adapter, configure the LanRover, and then re-install IPX on our test PC to establish a remote connection to our NetWare file server. Nor will SNM work with Windows for Workgroups if you have the IPX/SPX compatible transport installed.

One of the most useful features of the LanRover is its virtual connection capability, which can save money on long distance phone calls. Unlike the other products in this review, the LanRover will automati-

3Com Corp.

AccessBuilder 2000

It doesn't have internal modems or ISDN adapters like the LanRover/Plus or LAN-express, but 3Com's AccessBuilder 2000 provides a powerful and affordable solution for workgroup remote access. Housed in a rack-mountable chassis similar to the LanRover/Plus, the AccessBuilder 2000 comes with graphical, user-friendly management software. Though it doesn't do dial-out, it provides dial-up capability, LAN-to-LAN routing, and bandwidth on demand. And the AccessBuilder 2000 performed admirably on our performance tests. The unit is available in 4-port (\$2,795) and 8-port (\$3,895) asynchronous models.

Installing and configuring the AccessBuilder was a snap. The product offers two options for configuring users and ports: a terminal and the Windows-based TABM (Transcend AccessBuilder Manager) software. Like Microcom's expressWatch software, TABM is a graphical utility that lets you view all of your remote-node servers.

To set up a port, you simply select the graphical port image and select from a list of modems. Unfortunately, the AccessBuilder offers a limited list of modem initialization strings. To set up users, you can manually enter individual names and security rights, or you can import user information from the Novell NetWare Bindery or NDS (NetWare Directory Services). This is a great feature if you have dozens of users.

The TABM utility is also useful for managing multiple AccessBuilders from a single location. TABM can keep track of who is connected and for how long. You can also keep track of any network or dial-up errors and other traffic information. Another nice feature of TABM is the ability to monitor usage based on network protocols. This will help you determine if remote clients are using the AccessBuilder as a way to access the Internet through the company's TCP/IP router. The TABM utility works with a dial-up connection or any network running TCP/IP or IPX.

Like the LanRover/Plus, the AccessBuilder 2000 provides bandwidth or tariff management to keep your connection costs low. Bandwidth management automatically disconnects a link when no traffic is moving and reestablishes the con-

nection when you transmit data to or from the remote network. It can require several seconds to reestablish a modem connection, but re-connection time is lightning-fast with ISDN.

The AccessBuilder's bandwidth-on-demand feature allows you to add more throughput as the connection requires. Bandwidth on demand works only with the LAN-to-LAN connections and is best used with the ISDN Multilink PPP specification that allows you to add more channels as necessary. The AccessBuilder, however, also allows you to use several dial-up asynchronous connections to increase LAN-to-LAN performance.

Although it didn't provide a setup string for the U.S. Robotics Courier modem used in our performance test, the AccessBuilder performed impressively. With its capability for integration with larger AccessBuilder servers and its low price tag, the AccessBuilder is a great server to set up at your remote workgroup locations.

AccessBuilder 2000. List price: For tested configuration, \$3,895. 3Com Corp., Santa Clara, CA; 800-638-3266, 408-764-5000; <http://www.3com.com>. Circle 955 on reader service card.

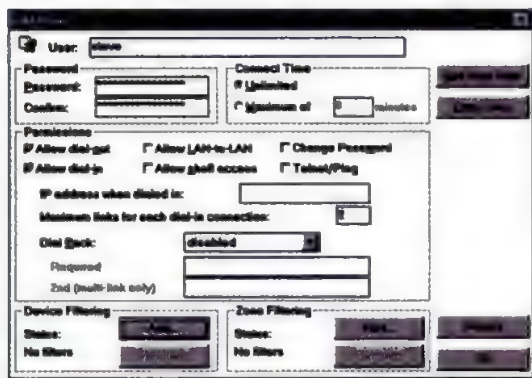
Whittaker Xyplex

Network 3000 Remote Access Router

As if deciding which product in Whittaker Xyplex's Network 3000 line would best meet your remote-access needs wasn't confusing enough, installation and operation are equally confounding. Though the Network 3000 Remote Access Router boasts impressive performance and several connectivity options, it doesn't provide any bundled remote-access software and is difficult to set up, configure, and manage.

We tested a \$3,195 Network 3000 Remote Access Router with one asynchronous module, eight ports, and one synchronous V.35 module. For the same price, however, you can purchase two asynchronous modules or one asynchronous and one ISDN module.

Installation was supposed to be as easy as running the Windows-based FocalPoint utility, but we thought the Network 3000 was the most complicated product to set up. FocalPoint allows you to select which modules you have installed and set up the ports and the type of network protocols you want to use (including TCP/IP and IPX). FocalPoint simultaneously cre-



LANROVER/PLUS: Shiva's SNM utility provides easy network protocol and dial-in/dial-out setup.

cally suspend and resume a physical connection without the user knowing anything has happened. By spoofing the network protocols, LanRover tricks the remote PC into "thinking" it is still connected to the network. It will automatically re-connect if data needs to be transmitted to or from the host network.

While the LanRover was not the fastest product in our test, its performance numbers ranked with top of the pack. Shiva boosts performance using Stac's compression algorithm over both analog and ISDN connections. With ISDN, the LanRover will work with the MP (Multilink PPP) specification to provide up to 128 Kbps of raw bandwidth.

The LanRover is a great remote-node solution for small or large networks. The product is easy to install and use, provides client software for almost every OS on the market, and allows you to start with a slow analog solution and move up to ISDN as the need arises. With dial-in, dial-out, bandwidth on demand, and LAN-to-LAN capabilities, there isn't much the LanRover can't do.

LanRover/Plus 4.0 List price: For tested configuration, \$8,999. Shiva Corp., Bedford, MA; 800-977-4482, 508-788-3061; <http://www.shiva.com>. Circle 954 on reader service card.

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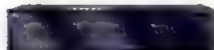
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SUMMARY OF FEATURES

Remote-Node Servers

PC MAGAZINE
NETWORK EDITION
EDITORS' CHOICE

	Attachmate Corp. RLN Access Server	Cisco Systems Inc. Cisco Access Server 2500	Microcom Inc. LANtelligence 4000	Shiva Corp. LanServer/Plus	3Com Corp. AccessBuilder 2000	Whittaker Xyplex Network 3000 Remote Access Server
List price (tested configuration)	\$7,595	\$3,545	\$5,190	\$8,999	\$3,895	\$3,195
Hardware						
Number of analog/ISDN ports	32, 32	8, 0	12, 8	8, 4	8, 0	16, 2
Internal V.34 modem	■	■	■	■	■	■
Internal ISDN adapters	■	■	■	■	■	■
Number of WAN interfaces	32	2	12	8	8	2
Bandwidth on demand	■	■	■	■	■	■
Dial-in/dial-out capability	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
LAN-to-LAN connection	■	■	■	■	■	■
Software						
Includes remote-control software	■	■	■	■	■	■
Supported NOS protocols:						
AppleTalk, IPX/SPX, NetBIOS	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
PPP, TCP/IP	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Supports IP over ISDN	■	■	■	■	■	■
Simultaneous log-on with single name	■	■	■	■	■	■
Supports NetWare VLMs	■	■	■	■	■	■
Management						
Management via remote console	■	■	■	■	■	■
Monitors and resets individual ports	■	■	■	■	■	■
Single-port configuration/statistics	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Security						
Call-back/roaming options	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Data encryption	■	■	■	■	■	■
Integrate log-on with NetWare's Bindery	■	■	■	■	■	■
Password authentication supported	■	■	■	■	■	■

ates a complicated script that is downloaded to the Network 3000 unit. Unfortunately, FocalPoint didn't correctly configure our server, so we spent several hours in front of a PC typing cryptic terminal commands. The documentation was not very thorough, so we also spent a lot of time on the phone with technical support. To make matters worse, our unit had a faulty asynchronous module that the vendor had to replace before we could begin testing.

Although you can use most PPP dial-up software, such as the Dial-Up Networking utility in Windows 95, to connect to the Network 3000, the product doesn't include any software for DOS- or Windows 3.x-based PCs. The vendor recommends using Remote Office, from Stampede Technologies, for these remote clients. Currently, there is no solution for dialing out across the network.

Some of the strong points of the Network 3000 include top-notch performance and scalability. Each available module in the same unit interacts with the others. For example, you could connect to the net-

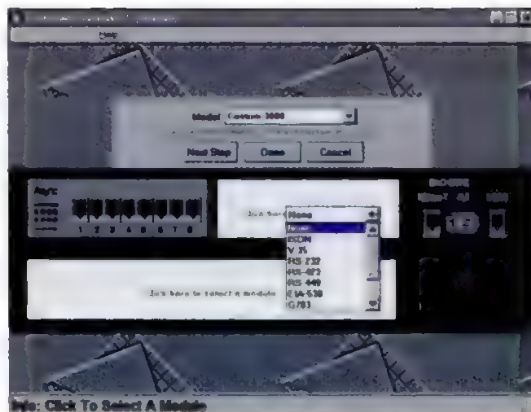
work via the dial-up asynchronous module and then automatically go through the WAN module in the same unit to connect to other remote servers. The ISDN modules also work with Multilink PPP and provide bandwidth on demand to increase the speed of the connection.

While all of these connectivity options are nice, they are difficult to manage and configure. And you have to execute complicated commands to gather information and monitor for errors. The Network 3000 does include a SNMP agent so you can use an optional SNMP management console, such as Whittaker Xyplex's ControlPoint, to monitor your Network 3000 servers graphically.

If you need to have analog, Frame Relay, ISDN, and X.25 all in the same box, Whittaker Xyplex's Network 3000 family of products may be your solution. If management is important and you need an easy way for your re-

mote users to establish a dial-up remote-node connection to the LAN using multiple protocols, however, you may want to check out one of the other products in this roundup. □

Network 3000 Remote Access Router. List price: For tested configuration, \$3,195. Whittaker Xyplex, Littleton, MA; 800-338-5316, 508-952-4700; <http://www.xyplex.com>. Circle 956 on reader service card.



NETWORK 3000: A graphical view of installed modules.

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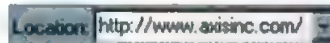
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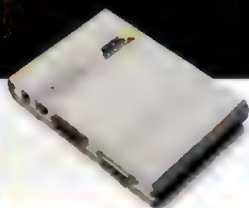
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First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

NETWORK MANAGEMENT SOFTWARE

Managing the Total Package

By Steve Rigney

If your network is big enough to require a management package, chances are the network isn't nice and neat—but big and messy. You need software distribution, hardware inventory, software inventory, remote control, and traffic monitoring utilities. In addition, your LAN may have grown to include clients running DOS, OS/2, Microsoft Windows 3.x, Windows 95, and Windows NT. You may also have different flavors of server platforms.

In this miniroundup, we look at two full-featured solutions: Intel's LANdesk Management Suite, Version 2.5 (LDMS), and CapaCity's NetCon, Version 3.0.

Intel Corp.

LANdesk Management Suite

Think of all of Intel's network utilities, including Server Manager Pro, Workgroup Manager, and Virus Protect. Now think of the best parts and pieces of each and you have LANdesk Management Suite (LDMS), Version 2.5. LDMS offers software distribution, hardware and software inventory, remote control, software metering, server and network traffic statistics, and integrated alerting and notification. But its major selling point is its ability to manage both Windows NT- and NetWare-based file servers and all of your client PCs, whether they're running DOS, Windows 3.x, Windows 95, Windows NT, or OS/2.

LDMS is still tied to NetWare, however; because of its reliance on NLMs, you must have at least one NetWare 3.x server or later on your network and 5 to 10MB of RAM on your file server for the NLMs. Another of LDMS's drawbacks is its use of a Btrieve database for storing network management information. Unlike NetCon's ODBC-compliant database, a Btrieve database doesn't provide the flexibility to export your network management information. Intel is working on a SQL/ODBC database for LDMS that will be provided free to current users.

This product retails for \$750 for a five-user license; it comes on a single CD-ROM and includes detailed documentation. We found installation fairly straightforward, though we did have to edit the NetWare and Windows NT logon scripts manually and make changes to a few NetWare NCFs.

Like NetCon, LDMS allows you to manage multiple client PCs running DOS, all versions of Windows, and OS/2. LDMS also provides remote control for NetWare servers and will include a free version for Windows NT by the end of the summer. And it gathers SNMP information and

can monitor other servers running Microsoft's SMS and Novell's ManageWise.

A hot new feature of LDMS is remote control and management of client PCs across the Internet or corporate intranet. This lets you control any client PC equipped with a modem and Web browser. In addition to controlling users' PCs, you can scan hard disks for software, gather hardware information, and send software updates.

LDMS offers powerful server statistics for NetWare and Windows NT file servers, which NetCon does not. You can also use LDMS to monitor network traffic from all your servers and client PCs. The monitor will automatically write information to a log file, so you can let it run

Continues on page NE22

ISDN ROUTERS

Cisco Makes Routers EZ

By Russell Iwanchuk

With the explosion of the Internet, everyone's got to have a home page. And if Cisco Systems has its way, your router will be no exception.

Playing a central role in this act is the Cisco 1004 ISDN router (\$995 list). The router, a tidy desktop unit that's a perfect fit for its small- and home-office market, has one 10Base-T Ethernet port, one ISDN BRI port, an administration console, and an integrated NT-1.

The Cisco 1004 also has a PC card slot, so you can upgrade its software with a flash memory card painlessly. Its simple LED provides an instant status report

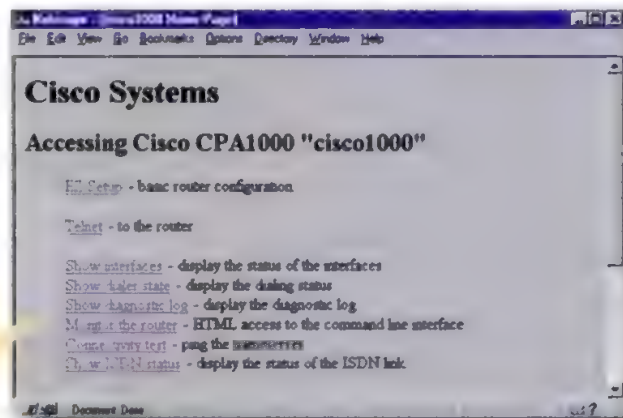
for either B channel and for LAN port activity. This router also supports Multilink PPP, enabling throughput of 128 Kbps using both B channels.

But what gives the Cisco 1004 its star billing is the new EZ Setup, which is part of ClickStart. ClickStart is HTTP server

software based on Web technology that is integrated into the Internetwork Operating System and allows TCP/IP hosts on any platform to access the router's IOS using a Web browser. With the 11.0.6 release of its IOS, Cisco brings ClickStart to its router line. ClickStart lets users who are not proficient in Cisco's arcane command-line interface use a Web browser to do any-

Continues on page NE26

EZ DOES IT: Cisco's HTML-driven setup eases the usual sticky router configuration.



First Looks

LANDesk

Continued from page NE21

overnight or over the weekend.

The Alert Management System (AMS) utility is also unique and useful. It is a unified alert and notification utility that lets you know if there's a problem and then takes steps to fix it.

Another plus on the LDMS feature list is the Desktop Management Interface (DMI) management control panel. The console allows you to manage and control all the DMI hardware and software components on your network. Components that include DMI can provide detailed low-level information, such as the exact date of the BIOS, type of keyboard, and all the IRQs for your hardware. **LANDesk Management Suite, Version 2.5.** List price: For five users, \$750. Intel Corp. Santa Clara, CA; 800-548-4725; fax, 408-765-1821; <http://www.intel.com>. Circle 958 on reader service card.

CapaCity Software Corp.

NetCon 3.0

Though not as popular as some of the better-known network management packages, CapaCity's NetCon 3.0 has such powerful features that you may wonder how you lived without it. It includes hardware and software inventory, software metering, software distribution, automatic job scheduling, network file management, remote control, and a help-desk utility. The management console runs on multiple platforms including all flavors of Windows and OS/2, and you can control multiple client PCs running DOS, Windows 3.x, Windows 95, Windows NT, and OS/2.

What the product lacks is network traffic information, server statistics, and virus protection, and we found it difficult to use at times. For example, the main menu is somewhat confusing and hard to navigate. Everything is presented hierarchically, and it takes several mouse clicks to get

“ This LDMS product just hopped onto our radar screen, but it's not a new (read immature) product. It's been popular in Europe for a while, and the company is now directing some marketing at the U.S. I predict it will do quite well in our next roundup of network management products.”



Frank Dertler



Gail Shaffer

“ It's impressive, Frank, but it's still an NLM. Our readers are adopting Windows NT, Unix, and OS/2. Novell's licensing strategies make it expensive to increase the size of 3.x LANs and push people to 4.x upgrades, but many people are totally jumping ship. LDMS will be more impressive when it doesn't rely on having a NetWare server somewhere in the system.”

to the most basic information.

Unlike LDMS, however, NetCon doesn't require any server specific drivers, so you aren't limited to a specific NOS. NetCon will work on most major networks.

This package retails for \$995 for a 10-user license with a single console, and site licenses of 100 or more cost about \$60 per client. You receive one console license for every 100 additional client licenses you purchase, or you can purchase a console license for \$495.

Compared with LDMS, NetCon is a snap to install. The software comes on a single CD-ROM or multiple diskettes, and documentation is available online or in hard copy.

After we got the product installed, we found one of our favorite features: NetCon's help desk. You can use the help desk to log problems on a client PC and create a trouble ticket automatically. On our test, we used the built-in alerts to notify the administrator whenever a client PC was low on disk space or memory. And we used NetCon's automatic configuration capture to see if the user made changes that caused the problem.

NetCon's software inventory utility provides an extensive list of software packages, vendors, and version information. You

can also manually add any software information that NetCon can't determine from the hard disk scan. The information is then automatically added to the NetCon database, which was created using Microsoft Access 2.0 and is compatible with any other Open DataBase Connectivity-compliant (ODBC) application so you can import and export information to and from other programs.

While NetCon's software inventory is top rate, the hardware inventory doesn't provide as much information as LDMS's. The query/action capabilities of the product are unique and extremely powerful. We were able to compile a list of all client PCs with less than 30MB of disk space, automatically delete unnecessary files, and perform other tasks. For each criterion you can base a query on, NetCon allows you to create a dynamic group.

As for remote control, the developers at NetCon decided to bundle Stac's ReachOut instead of developing their own remote-control solution. ReachOut allows you to control your DOS, Windows 3.x, and Windows 95 client PCs remotely across any network running IPX, TCP/IP, or NetBIOS. ReachOut also provides a chat and file transfer utility so you can communicate and send files to the remote PC.

NetCon 3.0. List price: For 10 users, \$995. CapaCity Software Corp., Berlin, MA; 508-838-0264; fax, 508-838-2064. Circle 959 on reader service card.

SUMMARY OF FEATURES

Network Management Software

	LANDesk Management Suite	Microsoft System Management Server*	NetCon
Products listed in alphabetical order			
Software inventory	■	■	■
Hardware inventory	■	■	■
Software metering	■	■	■
Software distribution	■	■	■
Server replication	■	■	■
Network traffic monitoring	■	■	■
Alert and notification	■	■	■
Help desk	■	■	■
Virus scanning	■	■	■
Remote Control			
NetWare	■	■	■
Windows NT	■	■	■
Windows 3.x	■	■	■
Windows 95	■	■	■
DOS	■	■	■
Server statistics			
NetWare	■	■	■
Windows NT	■	■	■

*Reported for comparison.



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Cisco 1004

Continued from page NE21

thing that's possible from the command line.

EZ Setup uses an intuitive HTML form to gather the few pieces of information needed to get the router up and running. No longer do companies need on-site experts when deploying routers; anyone comfortable with a Web browser will suffice.

Other currently or soon-to-be shipping Cisco routers that can be configured with EZ Setup are the Cisco 1003, which is identical to the Cisco 1004 but lacks an integrated NT-1 (\$795); the Cisco 1005, which has the same base configuration as the Cisco 1004 but features an asynchronous port rather than a BRI port (\$795); and Cisco's IP Exchange, an Internet gateway for Novell NetWare users (\$2,495 for a 20-user version).

In addition, Cisco plans to extend the EZ Setup functionality to other lines of routers. If you bought a 1000 series router before the 11.0.6 release, however, don't despair: You can download the IOS image for free and update your software.

Using HTTP to configure network devices makes good sense. You can access the router from any platform that sports a TCP/IP stack and a browser, and the graphical interface possible with HTML makes configuring routers a lot less daunting.

Configuring with HTML isn't new to the router industry. Tribe Computer Works was first with its WebManage software, which was released more than a year ago. Still, very few people have Tribe routers. Cisco's leadership in the router industry should make HTTP configuration more widespread.

In the lab, we found that

HTTP configuration lives up to its promise of easing out-of-the-box router configuration. We used our test unit to connect a small TCP/IP LAN to an ISDN ISP, and we were pleased with the results. After connecting the router to your LAN and BRI ports and powering it up, you simply point a browser on your network to a certain URL (<http://new-router.cisco.com>).

The router serves up the EZ Setup page—you fill in the blanks. Click on Submit and the router saves the configuration and restarts a functioning ISDN router, provided the router on the other end uses defaults Cisco found to be common. We had to fiddle with a couple of settings to get our router to be interoperable with the Ascend at the other end of the cable.

Our only real complaint with EZ Setup is that when you use it to browse an already-config-

ured router, the fields of the configuration form are blank. Apparently, it's easier to get the configuration information into the IOS than to get it out and into an HTML form. Cisco is working on this problem. But we never had to use a serial cable or a terminal emulator (the way you usually access a router for the first time).

The Cisco 1004 has the same hardware as when it was announced in September 1995, but the addition of HTTP configuration to the IOS makes this ISDN router really stand out. It's an excellent way to connect a remote office to a central office or connect a LAN to an ISP. Look for other vendors to jump on the bandwagon.

Cisco 1004. List price: \$995. Cisco Systems Inc., San Jose, CA; 800-553-6387; fax, 408-526-4100; <http://www.cisco.com>. Circle 957 on the reader service card.

MULTIPLE ACCESS By Steve Buehler

If It Ain't Broke. . .



"If it ain't broke, don't fix it." Many a network administrator lives by these words. A handy corollary is that if something is broken, the last changes that you or your users made are probably responsible. This thinking governs the approach of the big boys of network management—Symantec's Norton Administrative

Suite and McAfee's SaberTools 6.0. If your network management software can observe the changes occurring on users' desktops, as these programs do, you've got a head start on tracking problems and offering solutions. But although both tools keep track of hardware and software configurations on your users' desktops, they are pretty high-end and might not match your needs exactly. Two new programs with slightly different aims from those of Symantec's and McAfee's products just showed up at PC Magazine's network labs.

If your users have opted for the stability and security of OS/2 on their desktops, a new offering called Desktop Commander (\$49 per seat), from Pinnacle Software (317-279-5157), is well worth checking out. This product asks a user to sign on, then presents a "Machine-Independent Desktop" as the administrator has defined it. The same desktop always appears for a specific user regardless of the particular machine. This lets you set up customized desktops for groups (such

as tellers or order-entry personnel) that require only certain applications and services. Security-rights checking for individuals adding to, modifying, or deleting from the desktop lets you prevent the installation of DOOM where you don't want it.

Desktop Commander is easy to install and removes the need for using REXX programming to set up standard desktops. And in an interesting twist, because one of Pinnacle Software's cofounders came from American Airlines' 250,000-node-network environment, Pinnacle designs this product (and everything in the product line) to monitor the efficient use of network bandwidth.

The other new product family in this area consists of NodeVision Pro and NodeVision, from Fresh NetSoft (602-497-4628). NodeVision Pro offers many of the same features that the Symantec and McAfee products do—hardware and software inventory, application installation and configuration, and application metering. But at \$499 per console and \$10 per workstation, this program is targeted at the value-driven purchaser.

If all you want is to handle changes to desktops, the most common cause of users' problems, then Node Vision (\$298 per console) may be sufficient. With an easy-to-use interface, this product is a real time-saver if your users occasionally make mistakes in altering their desktops.

If you can remember the last time you got through to a vendor's tech-support personnel, you know that they ask first about recent changes in the network. With these products, you can be prepared when your users ask you to help clean up the mess they just made. Now you can . . . "just fix it."



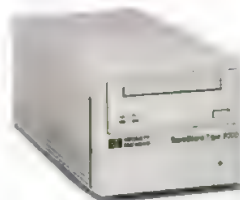


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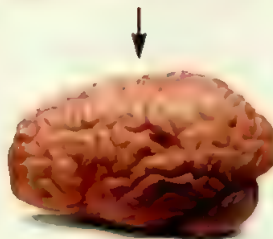
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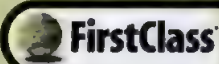
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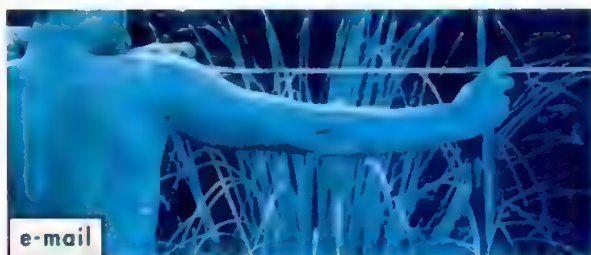
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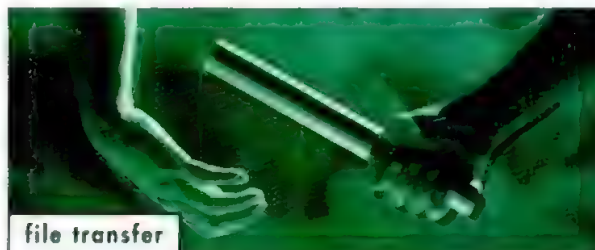


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PC Labs tests 58 presentation, value, and lightweight Pentium-class portable PCs to see which ones deserve a place in your briefcase.

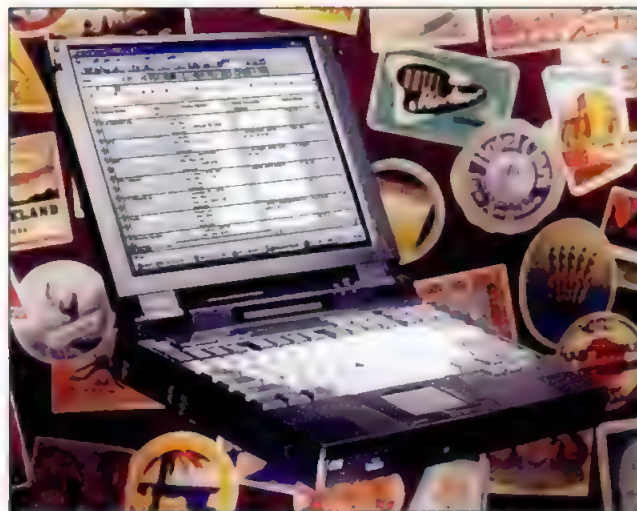
My guiding-star always is, Get hold of portable property.

— Charles Dickens, *Great Expectations*

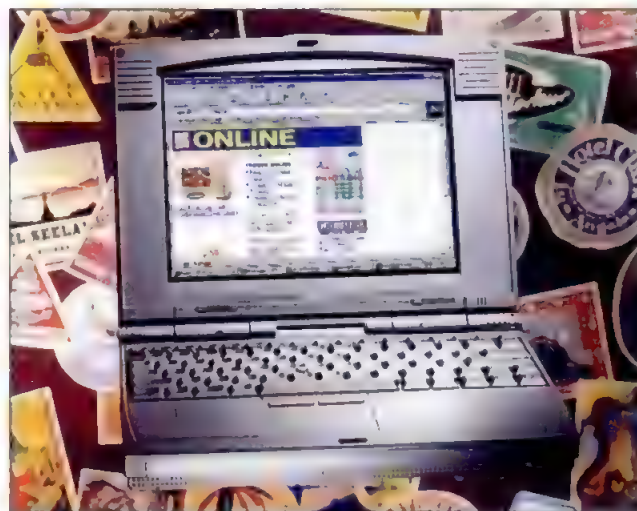
By Cade Metz

Dickens's guiding star may have a greater hold on the PC industry than it ever had on his nineteenth-century vagrants. As the disparity between notebook and desktop performance continues to lessen, the consumer's yen to get hold of portable property continues to escalate. Sales of portables will grow twice as fast as those of desktops this year and could account for a third of the PC market by the end of the decade. Needless to say, this trend has not been lost on the industry's major players.

Each of the top ten desktop PC vendors now sells notebooks as well. Meanwhile, Japanese giants Fujitsu and Hitachi have just entered the U.S. market with portables, not desktops, as their primary focus. Because so many companies wish to purchase all of their machines from a single source, vendors have to provide impressive notebook offerings or risk losing potential desktop customers. This realization has certainly taken hold at the industry's desktop sales leader, Compaq, which has completely revamped its notebook line after falling behind Toshiba and IBM in the mobile arena. On the flip side,



PRESENTATION NOTEBOOK If you're not willing to sacrifice performance or features on the road, the presentation notebook is the system for you, complete with SVGA display, integrated CD-ROM drive, and cutting-edge video and multimedia features. Price: \$3,000 to \$7,000.



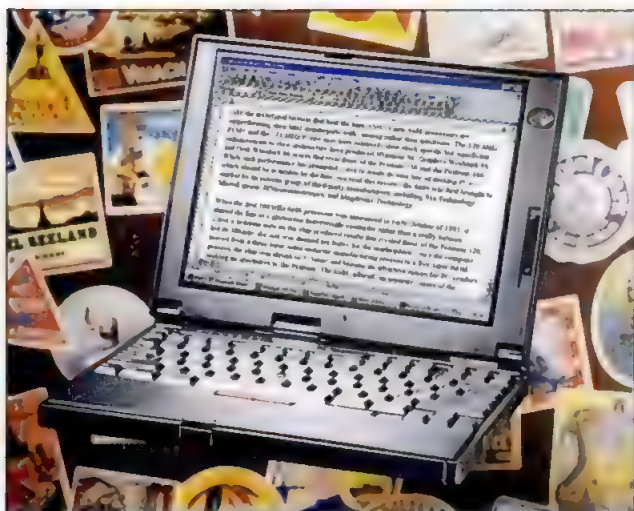
LOW-END VALUE NOTEBOOK If you're on a budget, consider the low-end value notebook class. Systems are typically equipped with dual-scan displays, 100-MHz Pentium CPUs, and 770MB hard disks but may not have a CD-ROM drive option. Price: \$2,300 to \$3,700.

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HIGH-END VALUE NOTEBOOK You'll find many of the high-end features of the presentation-class notebook in this category, including 11-inch and larger displays and CD-ROM drives, although you may sacrifice some leading-edge video and design features. Price: \$2,700 to \$5,000.



LIGHTWEIGHT NOTEBOOK Don't let their 5-pound travel weights fool you. Today's lightweight notebooks are fully loaded with 100-MHz Pentium and faster processors, 770MB or larger hard disks, full-size keyboards, and even 12.1-inch displays. Price: \$3,700 to \$5,000.

each of the top ten portable vendors will have a desktop line after Toshiba enters the desktop market this year.

Building competitive notebooks, however, is no walk in the hardware park. While Intel provides reference designs for desktop manufacturers—including sample chip sets, motherboards, and even complete systems in some cases—vendors must rely more on their own wiles when constructing portables. Companies such as Phoenix Technologies, a BIOS maker, offer reference kits for notebooks, but they don't provide much assistance when it comes to making systems small and sturdy—two key characteristics of successful portables.

SOPHISTICATED HARDWARE

Whoever first said "you can't take it with you" did not have computer hardware in mind. Today, you *can* take it with you. You can take Pentium/133s and 12.1-inch displays, 28.8-Kbps V.34 modems and CD-ROM drives, 64-bit graphics and SVGA resolution. Notebooks are still a long way from offering the 200-MHz Pentium or the Pentium Pro—which have already reached the desktop—but many mobile shortcomings that were present just six months ago ("On the Road with the Pentium," January 23, 1996) have already been erased, and several novel technologies are advancing the notebook's unique persona. Here, we examine this persona, reviewing 58 portables from 34 of the industry's leading vendors.

In our January roundup, we saw the fastest Pentium/120 machines outscore the Pentium/133 machines by 2 percent. This time around, the paradigm has shifted up a clock-speed generation. Of the 58 machines we review, 3 offer the Pentium/150, but the 20 Pentium/133 systems—many of which operate internally at 2.9 volts and are plugged into the new mobile Triton core logic chip set—proved to be more adept during benchmark testing. The performance of the 150-MHz systems was brought down by the chip's supporting cast. For example, one 150-MHz system used asynchronous L2 cache and DRAM instead of faster synchronous cache and EDO DRAM. As Intel releases its low-voltage mobile Pentium/150 in August and manufacturers begin to surround the chip with stronger components, you'll see more and better 150-MHz portables widely available by the end of the third quarter. Faster Pentiums that run at 2.5 volts will follow shortly thereafter, but low-voltage, "mobile" Pentium/200- and Pentium Pro-based laptops won't arrive until the end of 1997 or the beginning of 1998.

FEATURES PLUS

Examine our test results from different angles and create customized price/performance charts with an interactive version of this roundup at PC Magazine Online. Point your Java-enabled browser (we recommend Netscape Navigator 2.0 or later) at <http://www.pcmag.com/features/>.

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BIGGER AND BETTER DISPLAYS

The evolution of notebook displays is equally impressive. Over two-thirds of these 58 notebooks have graduated to SVGA (800 by 600 pixels), while the Toshiba Tecra already offers X VGA (1,024 by 768 pixels) on its 12.1-inch display. Although the Tecra's implementation is adequate, the X VGA display of the Sharp PC-9080—released in July but not reviewed here—delivers a much more refined resolution via

Super-High Aperture, a technology that increases brightness, provides a higher color ratio, and betters power consumption.

As early as next year, the crème de la crème will have stretched displays to 13.8 inches, which may be the end point for truly portable portables: The notebook would be a minimum of 9 by 12 inches if the bezel is half an inch wider than the display. Vendors moving toward bigger displays may make their systems thinner to

keep the overall volume constant; we expect to see one or two subnotebook systems (sans floppy disk drive) that are less than an inch thick by year's end.

After being the norm for such an extended period of time, 32-bit graphic chip sets are slowly being displaced. With ten reviewed systems using Chips and Technologies' 64-bit 65550 chip set, three using Trident's 64-bit Cyber chip set, and Dell's two machines leapfrogging to NeoMagic's

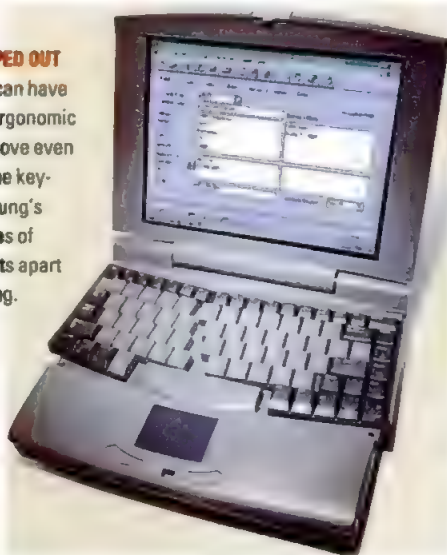
Picks and Pans: Pentium Notebooks

Here are some of the notable innovations and questionable design choices we found among this crop of 58 notebooks.

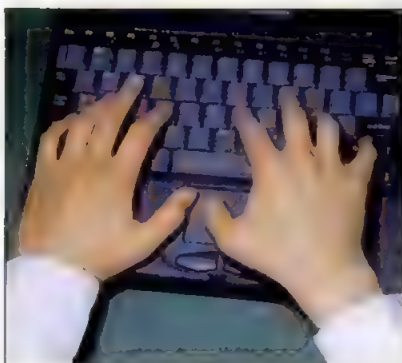
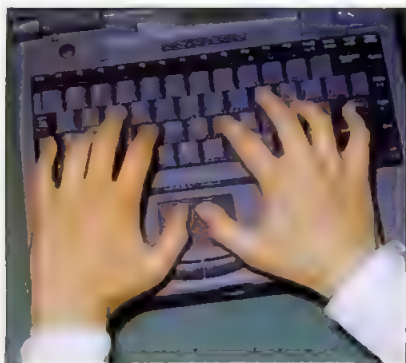


FLIPPED OUT

You can have the ergonomic keyboard you love even on the road: The keyboard in Samsung's SENS 810 series of notebooks splits apart for easier typing.



LOAD 'EM UP The Micron Millennia TransPort and the Unisys Aquanta MN provide about the same functionality, but you'll need a pretty big briefcase if you want to take all of the Aquanta's components with you.



IT'S A REACH If you're a touch-typist, look for a notebook with a touch pad that's slightly left of center (directly below the G and H keys), because otherwise, you'll be performing uncomfortable hand gymnastics.



GET CONNECTED The floppy disk drive in HP's OmniBook 5500 series has an external connector, so you can use the floppy disk and CD-ROM drives simultaneously—an added convenience.



128-bit MagicGraph NM2070, *almost* should become *definitely* by the end of the year. NeoMagic has already pushed the high end even further by supplying both Dell and Sharp with the new MagicGraph128V, which adds EDO memory and video acceleration.

OF DISKS AND CACHES

Like CPUs and displays, hard disks are enjoying their own steady increase in capacity. Currently, 12.7-mm drives can store 810MB of data, while 17-mm drives have risen to 1.2GB. In the coming months, however, 19-mm hard disks will reach upwards of 2.1GB, and shorter 12.7-mm drives will offer 1.4GB of storage; the end of 1997 could see at least one vendor reaching 5GB of capacity.

At the time of last summer's notebook roundup ("Your Portable Persona," August 1995), many vendors indicated they would drop external caches as they adopted EDO DRAM. Actually, the opposite has happened. A year ago, only a quarter of the machines we tested used an L2 cache. In this review, despite a secondary cache's tendency to use up both space and power, only nine machines did without it, and their performance suffered accordingly. More than one-third of the reviewed machines have EDO DRAM.

CD-ROM DRIVES COME ON STRONG

Whether they're integrated, part of a docking station, or an option that can be swapped for a floppy disk drive or battery, CD-ROM drives showed up in all but 12 of the reviewed machines. The de facto standard for this lot is 4X, but the Gateway Solo S5-120 and S5-133, the Micron Millennia TransPort, and the Toshiba Satellite Pro 420CDT and Tecra 720CDT already have 6X drives.

One of the most intriguing trends is modularity. Almost half of the reviewed units contain a bay that can accommodate a supplemental battery, floppy disk drive, or CD-ROM drive, or a second hard disk. As your needs change, you can swap hardware in and out without serious exertion.

Among pointing devices, the touch pad was used by 44 reviewed machines. Ten systems had pointing sticks, but those 10 include the top three sellers: Toshiba, IBM, and Compaq. Now that IBM has agreed to license its current TrackPoint

Presentation:

IBM ThinkPad 760ED
Micron Millennia TransPort

Lightweight:

IBM ThinkPad 560

One of the Editors' Choices in the presentation category is no stranger to the winner's circle: the \$6,999 IBM ThinkPad 760ED. Since the ThinkPad 700 series was introduced over three years ago, it has won many Editors'

Choice awards because of its cutting-edge components and great performance. The latest member of the 700 series is no exception to the rule. Powered by a Pentium/133 CPU, this portable was the top performer in this roundup on our Winstone tests. In addition to its nearly 3-hour battery life, it is the only system here to offer NTSC video-in as well as video-out.

Our other presentation-class Editors' Choice goes to the Micron Millennia TransPort. This machine marks Micron's entry into the notebook market, and it's a winner in every respect. Not only does the TransPort offer all the features you'd expect from a PC of this caliber—including a 12.1-inch active-matrix display and a 6X CD-ROM drive—it sells for only \$5,198.

In the lightweight category, our Editors' Choice goes to a notebook that breaks new ground in the under-5-pound class: the \$3,749 IBM ThinkPad 560. This Pentium/120 PC has the same footprint as a full-size notebook—which allows space for a 12.1-inch active-matrix display and a full-size keyboard—but it's only 1.3 inches thick and

High-end value:

Austin Edge CD
AST Ascentia J50

Low-end value:

WinBook XP5 P100

weighs only 4.8 pounds (travel weight).

Our two Editors' Choices in the high-end value class go to the \$3,499 AST Ascentia J50 and the \$4,171 Austin Edge CD. The Ascentia J50 is a great choice if you don't need a CD-ROM drive: This Pentium/133 portable was a top-notch performer in its class, and it offers a lithium ion battery as well as an integrated 14.4-Kbps fax modem. If you do need a CD-ROM drive, the 133-MHz Austin Edge CD should fill the bill. This machine offers a 4X CD-ROM drive, a stunning 11.4-inch active-matrix display, a 1.3GB hard disk, and nearly 4 hours of battery life.

Our low-end value Editors' Choice goes to the WinBook XP5 P100. Priced at only \$2,599, this PC features a Pentium/100 CPU, a 10.4-inch dual-scan VGA display, and an integrated 14.4-Kbps modem. Add to this close to 4 hours of battery life through its lithium ion battery pack and you have a great portable PC for a reasonable price.

We also award an honorable mention to the low-end value \$3,459 Dell Latitude XPi P100SD. This Battery-Mark champion had a time of 4:52.



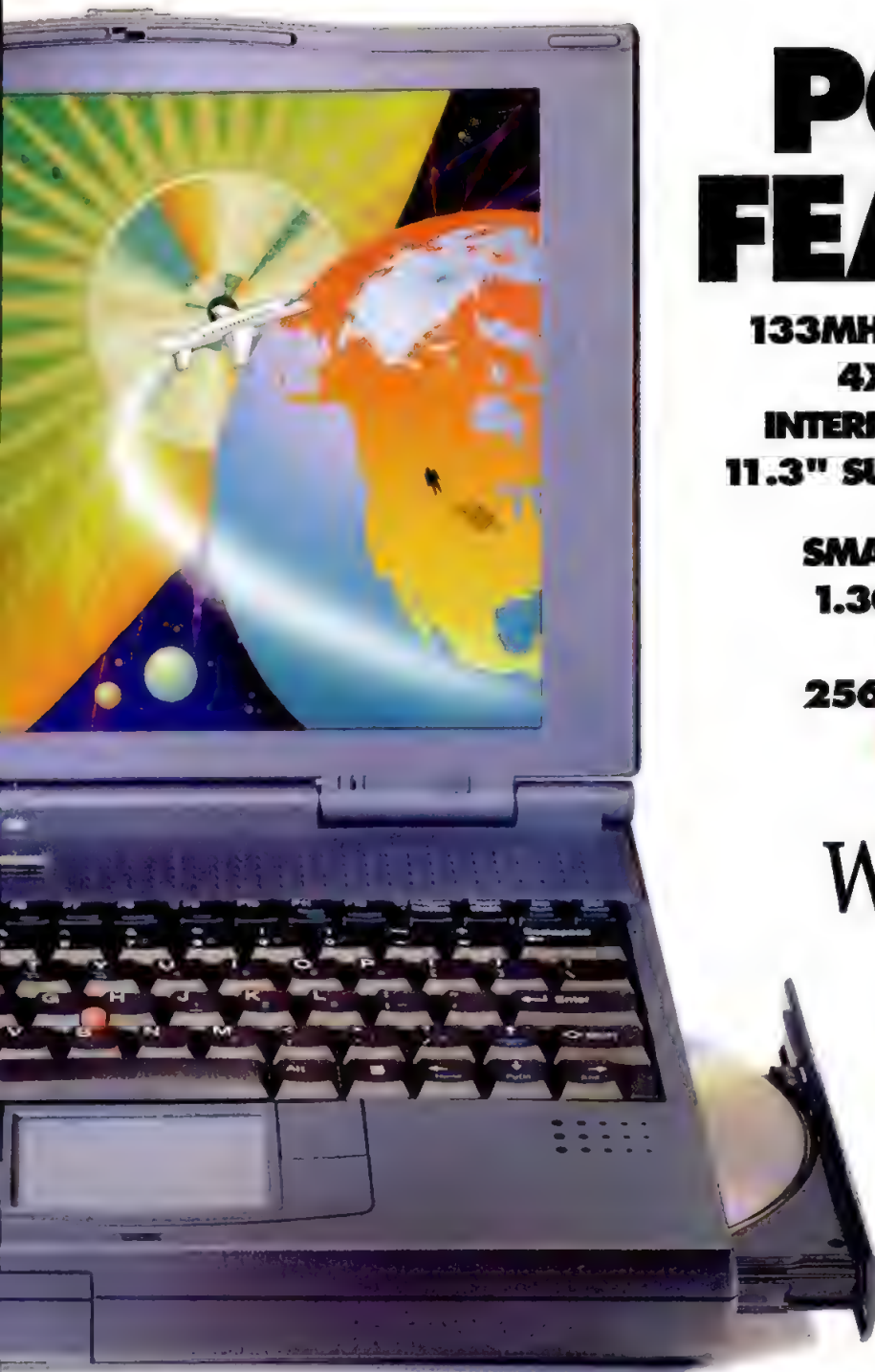
technology to other vendors, the pointing stick could become more prevalent; until now, IBM licensed only past versions of the technology. Trackballs have all but disappeared from the scene.

BATTERY POWER

As these improvements are made, the only casualty is the battery. Battery capacity is increasing by about 10 percent every year, but the rate of system power consumption is growing faster. Half of the

vendors in this review have gone to lithium ion batteries, but adoption has been slow, mainly thanks to short supply. Currently only a few vendors, including Sony and Matsushita, produce lithium ion batteries in quantity. While lithium costs more than nickel hydride, it provides more charge per pound and can offer more charge cycles during its lifetime.

The battery, however, may be less important than it's made out to be. Vendors say that nine out of ten notebook users



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16/1.3GB Active Matrix



Laptop Buyer's Guide
May 1996, WinBook XP5 P120
16/1.3GB Active Matrix Color



PC Laptop Editor's Choice—
Value Notebook of the Year
December 1995, WinBook XP, XP5

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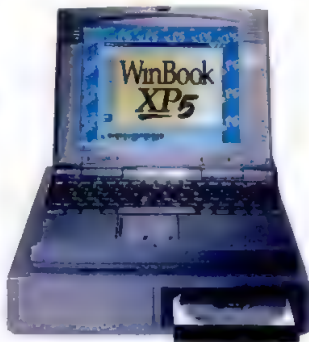
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MAJOR NOTEBOOK AWARDS



June 1996 Issue
WinBook XP5 P120
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Laptop Buyer's Guide
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PC LAPTOP
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—January 1996



August 1994
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- PARALLEL, SERIAL AND PS/2 PORTS

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spend most of their time plugged into an AC outlet and usually use battery power for no more than an hour at a time.

On the brand-name front, Duracell continues to have little success selling its standardized NiMH battery sizes.

ZOOMED PORT VIDEO, CARDBUS

Beyond the necessities, notebook vendors have also added several novel components over the past year that are designed to make mobile life easier—or at least a little more intriguing. Many of these technologies have yet to be widely implemented, but most should be more prevalent by the end of the year.

In terms of both technology and sales, Toshiba is on top of the industry. Its 20 percent market share comes close to matching the combined share of its two true challengers, IBM and Compaq, while its Tecra 720CDT machine is redefining the notebook ideal in ways matched only by the IBM ThinkPad 760ED. With a 10.3-pound travel weight (system, battery, and transformer), the Tecra is the heaviest machine here, a full 2 pounds heavier than the ThinkPad 760ED, but it has brought several heretofore unseen features to the market. Most notable is Zoomed Port Video (ZPV), a PC Card spec that will certainly narrow the multimedia gap between notebooks and desktops. The port—which will accept MPEG, television feeds, or video-conferencing signals via ZPV cards—intro-

RECENT REVIEWS

► **Pentium Classic: Still the One**
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101 midrange and high-end Pentium PCs

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May 28, 1996.....Page 100
We look at the state of the micro-processor market and test the first Cyrix 6x86-based PCs.

► **PowerHouse**
April 23, 1996.....Page 299
We review systems from 11 of the most prominent home PC vendors and separate their offerings into novice and experienced categories.

duces a high-speed connection from a PC Card slot to the notebook's audiovisual hardware by sidestepping the system bus. The end result is simply higher-quality full-motion video playback.

Although no ZPV cards were available and ZPV was offered only on the Tecra as we went to press, Toshiba and its supporters (Cirrus Logic, Sigma Designs, Sony, and Texas Instruments) are lobbying to have the architecture adopted as a PC Card standard. Independently, Compaq is planning to offer ZPV this summer on its new notebook, the Armada, and NeoMagic is adding support for it to its MagicGraph-128ZV graphics chip set shortly thereafter.

The Tecra also includes CardBus support, a second PC Card extension waiting for adoption. While the existing 16-bit PC Card interface provides acceptable modem and 10-Mbps LAN connectivity, it can't accommodate such technologies as 100-Mbps Fast Ethernet or high-speed SCSI, and it is hopelessly slow for RAM expansion. With the 32-bit CardBus interface, however, you may soon be running 100-Mbps network technologies through hardware the size of your credit card. NEC will join Toshiba with CardBus support in its new Versa 6000, planned for release by the time you read this.

FAST TRANSFERS

The 28.8-Kbps modems integrated into the Tecra, the IBM ThinkPad 760ED, and the Polywell Poly 500NB5 perform standard voice, fax, and data functions, and they also let you use these systems as answering machines and full-duplex speakerphones. The Tecra modem also provides cellular phone support, as do 29 of the other machines that we tested.

Infrared support is even more prevalent. Only six machines lacked infrared interfaces that adhered to the 115.2-Kbps standard specified by the IrDA (Infrared Data Association). With these wireless interfaces, you can live out your "Star Trek" fantasies by sending jobs to compliant printers or exchanging files with your desktop system at a distance of several yards.

HIGHLIGHTS

Pentium-Class Notebooks



Notebooks now account for almost 30 percent of all PC sales, leading to increasingly fierce competition among the elite manufacturers and rapid

*upgrades in portable technologies. To help end users navigate this fast-changing industry, we categorize today's notebooks into four classes: **presentation systems**, for mobile exhibitors who require SVGA displays and integrated CD-ROMs; **lightweight** systems, with travel weights of less than 5 pounds; **high-end value** machines offering active-matrix displays while allowing buyers to weigh performance against price; and **low-end value** portables, which also offer a price/performance trade-off but have dual-scan displays.*

SVGA resolution has become mainstream: Of the 58 machines we tested, 52 have graduated to 800-by-600 resolution; one, the Toshiba Tecra 720CDT, offers a 1,024-by-768 XGA display. In this review, 12 displays were roughly 12 inches along the diagonal, 19 were roughly 11 inches, and 27 were roughly 10 inches.



CD-ROM drives, while not always integrated, are available in some form on most notebooks. Many vendors allow you to plug into multimedia docking stations, but the increased use of modular bays has made CD-ROMs more mobile. Such bays allow you to swap various components—including batteries, floppy drives, hard disks, and MPEG decoders as well as CD-ROM drives—in and out of the same space. The standard speed for mobile

CD-ROMs is currently 4X, but 6X drives will become prominent by the third quarter of this year.



A wave of new mobile technologies has also gripped the industry over the past year. The Tecra now offers Zoomed Port Video (ZPV), which can speed up multimedia

presentation, and CardBus, which will let mobile users tap into such technologies as Fast Ethernet and high-speed SCSI via a 32-bit PC Card interface. Meanwhile, 52 reviewed systems provide infrared ports for data transfer, and 16 machines allow users to connect to standard TV screens. While PC Card modems are still the most prevalent connectivity devices, eight machines offer integrated modems—two of which contain a DSP for answering-machine and speakerphone functions.



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* Estimated street / selling price for the 2MB version. Windows 95 tests conducted by Matrox Graphics Inc. using Ziff Davis' WinBench 95.11864PC. 16MB of RAM and 256K cache at 1024 x 768 x 255 colors. 72 Hz. average frame under Windows 95. The Matrox MGA Millennium and Diamond Stealth 64 Video cards were configured with 2 MB of memory and the Number Nine image 128.2 was configured with 4 MB of memory for the PCI bus using driver releases 3.01.4.02.258 and 2.39 respectively.

CIRCLE 381 ON READER SERVICE CARD

The IrDA has just released a Version 1.1 spec that raises speeds to 4 Mbps—called Fast-IR, or FIR—but such speeds are not available from the machines reviewed here. Now that both OS/2 and Windows 95 have 4-Mbps support, however, vendors will soon be upgrading their interfaces. NEC and Sharp have already announced FIR support for their respective Versa 6000 and PC-9080 portables.

Lastly, 16 reviewed machines came equipped with NTSC (National TV Standards Committee) video-out ports (also known as *scan converters*), which allow mobile users to send notebook presentations to standard television screens. This is particularly appealing to mobile presenters who find themselves in a conference room with a television but not a PC projection system or a VGA monitor. One notebook, the ThinkPad 760ED, lets you reverse the process and bring video in.

REVIEW CRITERIA

To participate in this review, each system had to offer a Pentium-level CPU. All but one machine arrived with the Pentium itself; the Canon Innova 360CD is built around AMD's Am5x86-P75.

Each system also had to come with a color screen, Windows 95, a minimum 720MB hard disk, 16MB RAM, and a modem. On the road, modems are now a necessity—for remotely accessing your desktop, for e-mail, and for faxing. Eight of the machines under test, in fact, have forsaken removable PC Cards for integrated modems.

As in previous reviews, we use several categories to evaluate systems under test; each notebook is judged only against others in its category. In this particular roundup, we define four categories:

- presentation;
- lightweight;
- high-end value;
- low-end value.

Systems in the *presentation* class—which are most appropriate for the nomadic pitchman—had to have an SVGA

Suitability to Task

Scores reflect how well a product fares for particular types of functions or operations. These ratings do not take the prices into account. From best to worst, the possible ratings are *excellent*, *good*, *fair*, and *poor*.

The **desktop replacement** rating indicates how well each notebook serves as a substitute for a desktop PC. Factors contributing to this rating include display resolution and size, performance, and the availability of a docking station or port replicator.

The **road warrior** rating indicates how well the notebook is suited for prolonged use on the road. Key factors are battery life, travel weight, case dimensions, performance, screen size, keyboard, and the inclusion of an integrated fax modem.

Service & Reliability

Ratings are included for vendors that received at least 50 responses on our latest Service &

active-matrix display and an integrated CD-ROM drive. We asked vendors to send machines with the fastest CPU available, as well as the largest screen and hard disk. Price was considered, but it did not weigh heavily in this category. Twenty-one machines fell into this category, ranging in price from \$3,000 to \$7,000.

Since last summer's roundup, the word *subnotebook* is used with less frequency. The term—which refers to a system that forgoes an integrated floppy disk drive for greater portability—has been forsaken by some vendors in favor of such terms as *ultraportable* and *slimline*. We are opting for *lightweight*. To be included in this category, a system simply had to have a travel weight of less than 5 pounds, not including external floppy disk drive.

The *high-end value* class includes machines with active-matrix TFT displays, while the *low-end value* machines have dual-scan screens. The 13 low-end ma-

Reliability poll of 17,000 subscribers. These results reflect readers' experience with notebooks from a given vendor. For details, see our July 1996 issue.

The **reliability** rating is a measure of respondents' satisfaction with the reliability of the vendor's notebooks in use over the past two years.

The **repair** rating is a measure of respondents' satisfaction with the repair service provided by the vendor for notebooks in use over the past two years.

The **technical support** rating is a measure of respondents' satisfaction with the vendor's support for machines in use over the past two years.

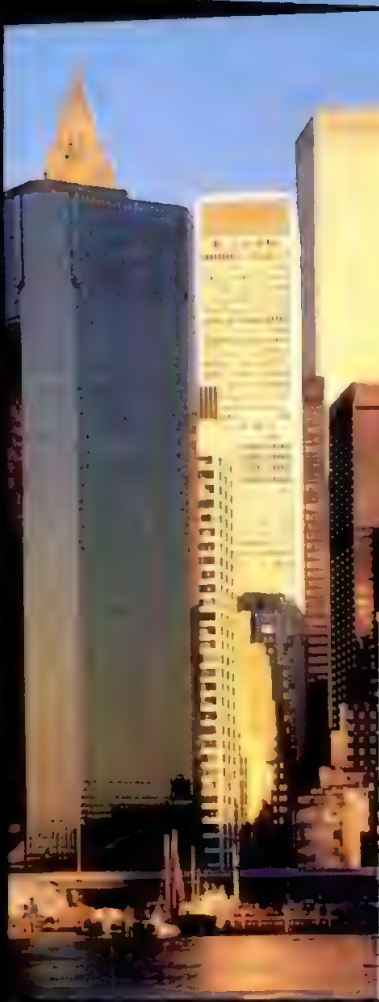
The **percent needing repair** rating is a measure of the proportion of notebooks that the respondents indicated needed repair during the past year.

chines deliver modest performance with modest components (typically a 10.4-inch VGA display, nickel hydride battery, and 770MB hard disk) at modest prices (\$2,000 to \$4,000). Naturally, the 18 high-end machines provide slightly greater performance and slightly more appealing hardware (11.3-inch SVGA screens, 1GB+ hard disks) but are tagged with slightly steeper prices (\$3,000 to \$5,000). In the high-end class, as in the presentation class, we emphasized high-end features such as TFT displays and speedy CPUs. But price is weighed much more heavily in this category; so while you will see a crossover in features between high-end and presentation, you may not see absolute leading-edge features in the high-end value notebooks.

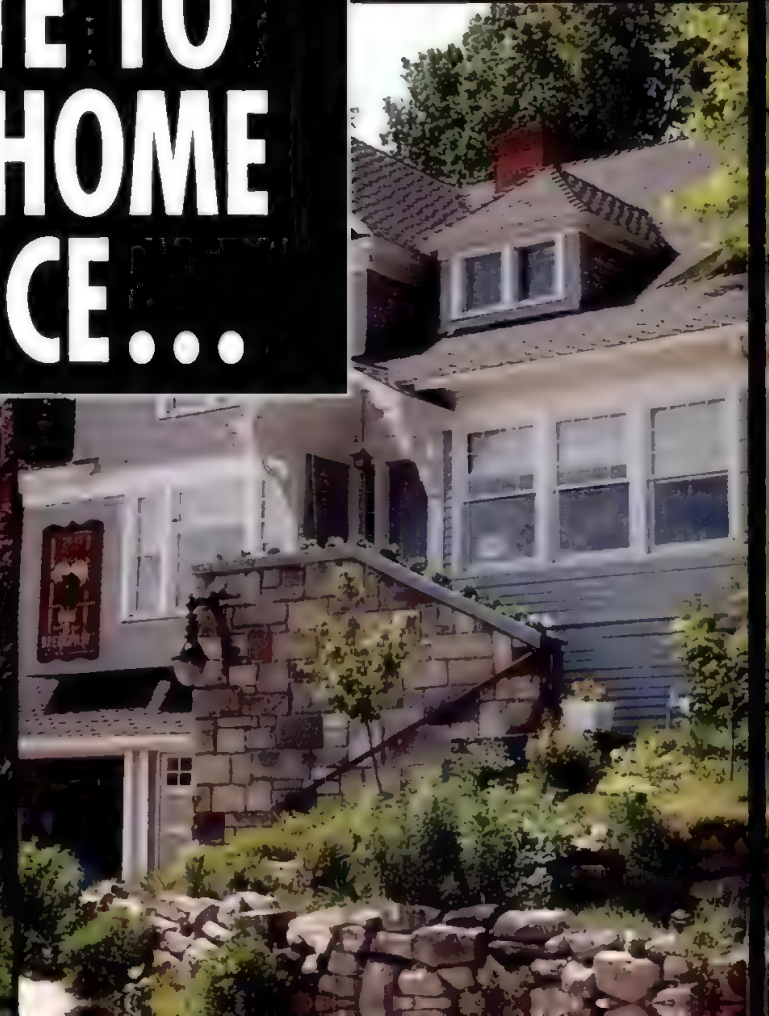
THE CHOICE IS YOURS

In the reviews that follow, you'll find notebooks that represent all that's available in the market today, from sub-\$2,000 value machines to fully loaded, \$6,000+ presentation machines that rival the best of today's desktops in terms of features and performance. We're certain that no matter your budget, you'll find a Pentium-class portable within these pages.

Our Contributors: CADE METZ is a staff writer at *PC Magazine*. ROBERT S. ANTHONY is a senior writer at *PC Magazine*. FRANK J. EVANS and CHARLES LIN are freelance writers, and BRUCE BROWN is a contributing editor of *PC Magazine*. MARY E. BEHR and ANUSH YEGYAZARIAN are staff editors at *PC Magazine*. CAROL VENEZIA was the associate editor in charge of this story, and RICHARD FISCO was the project leader.



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- 16-bit stereo sound & speakers
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- Microsoft® Mouse, 104-key keyboard
- Microsoft Windows® 95 & MS® Plus! CD
- ★ • 5-year/3-year Micron Power warranty*

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- Microsoft Office Pro 95 & Bookshelf 95 CDs

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- With 133MHz Pentium processor.....subtract \$200
- With 150MHz Pentium processor.....subtract \$100
- With 200MHz Pentium processor.....add \$200

MILLENNIA PLUS P166

- Intel 166MHz Pentium processor
- 512KB pipelined burst cache, flash BIOS
- PCI 32-bit Ultra SCSI Fast-20 controller
- 8X EIDE CD-ROM drive, 3.5" floppy drive
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- Tool-free minitower or desktop
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- With 200MHz Pentium processor.....add \$200

HOME MPC™ P133

- Intel 133MHz Pentium processor
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- 8X EIDE CD-ROM drive, 3.5" floppy drive
- 16-bit stereo sound & speakers
- 28.8 fax/modem, speakerphone, voice mail
- Microsoft Phone telephony software
- Internet ready: Internet in a Box from CompuServe®/Spry Internet Explorer
- Prodigy®, America Online® & CompuServe trial memberships
- PCI 64-bit 3D video, MPEG, 2MB EDO
- 15" Micron 15FGx, .28dp (13.7" display)
- Tool-free minitower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows 95 & MS Plus! CD
- Quicken® Financial Pak includes: Quicken Deluxe 5.0; Quicken Financial Planner; Quicken Parents' Guide to Money; Quicken Family Lawyer™
- Microsoft Home Pak includes: Works 4.0 for Windows 95; Publisher Deluxe for Windows 95; Encarta® 96; Encarta 96 World Atlas; Music Central® 96; Wine Guide; Arcade 1.0; Scenes—Sports Extremes Collection; Cinemania® 96; Julia Child Home Cooking; Best of Windows Entertainment Pak; CD Sampler (including Furry3 game demo)
- ★ • 5-year/3-year Micron Power warranty*

\$1,999

HOME MPC P166

- Intel 166MHz Pentium processor
- 256KB pipelined burst cache, flash BIOS
- 16MB EDO RAM • 1.6GB EIDE hard drive
- 8X EIDE CD-ROM drive, 3.5" floppy drive
- 16-bit 3D Wavetable stereo sound card
- Advent AV270 2x25 watt stereo speakers
- 28.8 fax/modem, speakerphone, voice mail
- Microsoft Phone telephony software
- Internet ready: Internet in a Box from CompuServe/Spry Internet Explorer
- Prodigy, America Online & CompuServe trial memberships
- PCI 64-bit 3D video, MPEG, 2MB EDO
- 17" Micron 17FGx, .28dp (15.8" display)
- Tool-free minitower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows 95 & MS Plus! CD
- Microsoft Office Pro 95 & Bookshelf 95 CDs
- Quicken Financial Pak includes: Quicken Deluxe 5.0; Quicken Financial Planner; Quicken Parents' Guide to Money; Quicken Family Lawyer
- Microsoft Home Pak includes: Works 4.0 for Windows 95; Publisher Deluxe for Windows 95; Encarta 96; Encarta 96 World Atlas; Music Central 96; Wine Guide; Arcade 1.0; Scenes—Sports Extremes Collection; Cinemania 96; Julia Child Home Cooking; Best of Windows Entertainment Pak; CD Sampler (including Furry3 game demo)
- ★ • 5-year/3-year Micron Power warranty*

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NEW



January 9, 1996
Millennia Plus



June 25, 1996
Millennia P166



June 18, 1995
Home MPC P90



May 30, 1995
Millennia P130



May 14, 1995
Home MPC P90



January, 1996
Millennia P133



January, 1996
Millennia P129



January, 1996
Home MPC P90



January, 1996
Millennia P133



December, 1995
Millennia P133

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Micron Millennia "In short, Micron covers all the bases with this Best Buy" — *PC World*, March 1996

Micron PowerServer "This is definitely a best buy" — *Computer Shopper*, January 1996

Micron Millennia TransPort "...nearly a dead ringer for IBM's ThinkPad...but performs better and saves you about \$2,500." — *PC Magazine*, April 1996

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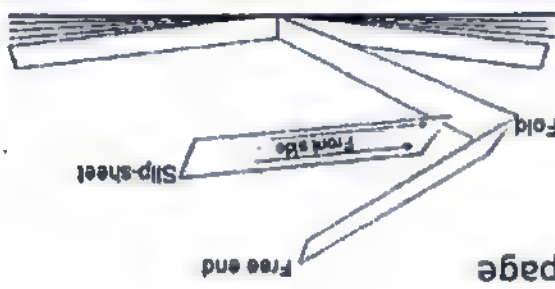
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- 30 days of free Micron-supplied software support
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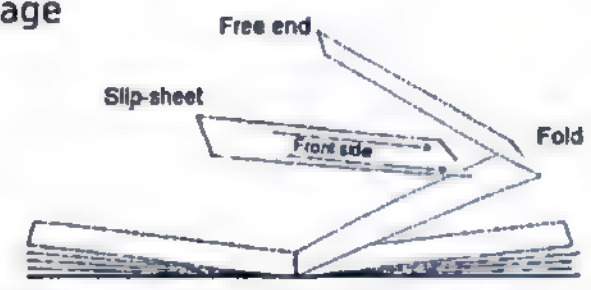
1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

Inverted Foldout slip-sheet



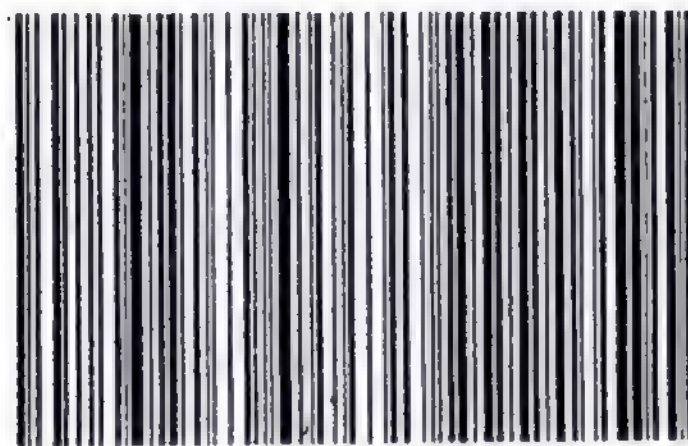
Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlpBack-0018

Back

1. Follow instructions on the other side



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3RD TIER

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Source: *PC World* Reliability & Service Monitor, May 20 - November 20, 1995

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- Intelligent modular lithium-ion battery
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- Built-in stereo speakers and microphone
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- S-Video and NTSC video outputs
- Headphone, microphone and line-in jacks
- 2 infrared ports, one front, one back
- Parallel, serial, VGA and 2 PS/2 ports
- Dimensions: 11.7" x 9.4" x 2.0", Weight: 6.9 lbs.*
- Nylon carrying case
- Microsoft® Windows® 95 and MS® Plus! CDs
- Microsoft Office Pro 95 and Bookshelf® 95 CDs
- Kensington® security lock†
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† 6.9 lbs. includes 3.5" floppy and one battery
† Lock secures both Millennium Transport and MicroVox

- 16MB EDO memory (48MB max.)
- 11.3" active matrix color display, 800 x 600
- 1.2GB removable hard drive

\$4,699 Business lease \$168/month

- 32MB EDO memory (48MB max.)
- Motorola® Montana 28.8 fax/modem
- 11.3" active matrix color display, 800 x 600
- 1.2GB removable hard drive
- 2nd intelligent modular lithium-ion battery

\$5,799 Business lease \$182/month

- 32MB EDO memory (48MB max.)
- Motorola Montana 28.8 fax/modem
- 12.1" active matrix color display, 800 x 600
- 1.2GB removable hard drive
- 2nd intelligent modular lithium-ion battery

\$6,299 Business lease \$198/month



POWERSERVER SMP P133

- Intel 133MHz Pentium processor
- Dual Pentium SMP ZIF sockets
- 512KB write-back cache, flash BIOS
- Slots: 5 EISA, 2 PCI, 1 EISA/PCI
- PCI 32-bit Ultra SCSI Fast-20 controller
- BX SCSI-2 CD-ROM drive, 3.5" floppy drive
- PCI 64-bit video, MPEG, 2MB EDO
- Full-size tower with 10 drive bays
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows 95 & MS Plus! CD
- ★ 5-year/3-year Micron Power warranty*

- 16MB RAM • 1GB SCSI-2 hard drive
- 15" Micron 15FGx, .28dp (13.7" display)

\$2,599 Business lease \$84/month

- 32MB RAM • 2GB SCSI-2 hard drive
- 15" Micron 15FGx, .28dp (13.7" display)

\$3,199 Business lease \$109/month

- With second 133MHz Pentium processor.....add \$399
- With Microsoft Windows NT® Workstation 3.51 CD.....add \$99

POWERSERVER SMP P266

- Dual 133MHz Pentium processors
- 512KB write-back cache, flash BIOS
- Slots: 5 EISA, 2 PCI, 1 EISA/PCI
- PCI 32-bit Ultra SCSI Fast-20 controller
- BX SCSI-2 CD-ROM drive, 3.5" floppy drive
- PCI 64-bit video, MPEG, 2MB EDO
- Full-size tower with 10 drive bays
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows NT Workstation 3.51 CD
- ★ 5-year/3-year Micron Power warranty*

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- 15" Micron 15FGx, .28dp (13.7" display)

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\$4,799 Business lease \$163/month



January, 1996
PowerServer SMP P133

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- Intel 200MHz Pentium Pro processor
- 256KB internal cache, flash BIOS
- 8X EIDE CD-ROM drive, 3.5" floppy drive
- 16-bit stereo sound & speakers
- PCI 64-bit 3D video, MPEG, 2MB EDO
- Tool-free minitower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows NT Workstation 3.51 CD or Windows 95 & MS Plus! CD
- Microsoft Office Pro 95 & Bookshelf 95 CDs
- ★ 5-year/3-year Micron Power warranty*

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- 17" Micron 17FGx, .28dp (15.8" display)

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- PCI 32-bit Ultra SCSI Fast-20 controller
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- 16-bit stereo sound & speakers
- PCI 64-bit 3D video, MPEG, 2MB EDO
- Tool-free mini-tower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows NT® Workstation 3.51 CD or Windows 95 & MS Plus! CD
- Microsoft Office Pro 95 & Bookshelf 95 CDs
- ★ 5-year/3-year Micron Power warranty*

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- 15" Micron 15FGx, .28dp (13.7" display)

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- Microsoft Mouse, 104-key keyboard
- Microsoft Windows NT Workstation 3.51
- ★ 5-year/3-year Micron Power warranty*

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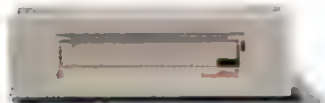
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- Iomega Zip IDE drive with 100MB removable cartridge.....\$99
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- Iomega Ditto 3200 (1.6/3.2GB) Travan Tape back up w/tape.....\$299
- Sony 4/8GB DDS-2 DAT SCSI Tape back up w/tape.....\$999**



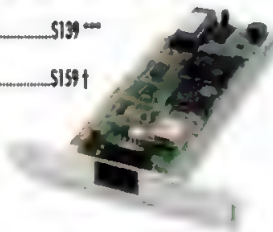
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Price/Performance Index: Pentium Notebooks

In our presentation category, IBM tops the performance/features list with the Editors' Choice-winning, \$6,999 ThinkPad 760ED. It boasts a 12.1-inch active-matrix display and 4X CD-ROM drive, plus best-of-roundup results on several tests. Close in features but well behind in price is another Editors' Choice, the \$5,198 Micron Millennia TransPort offering a 12.1-inch TFT display, a 1.2GB hard disk, a 6X CD-ROM drive, and great performance.

Our two Editors' Choices in the high-end value category also stand out

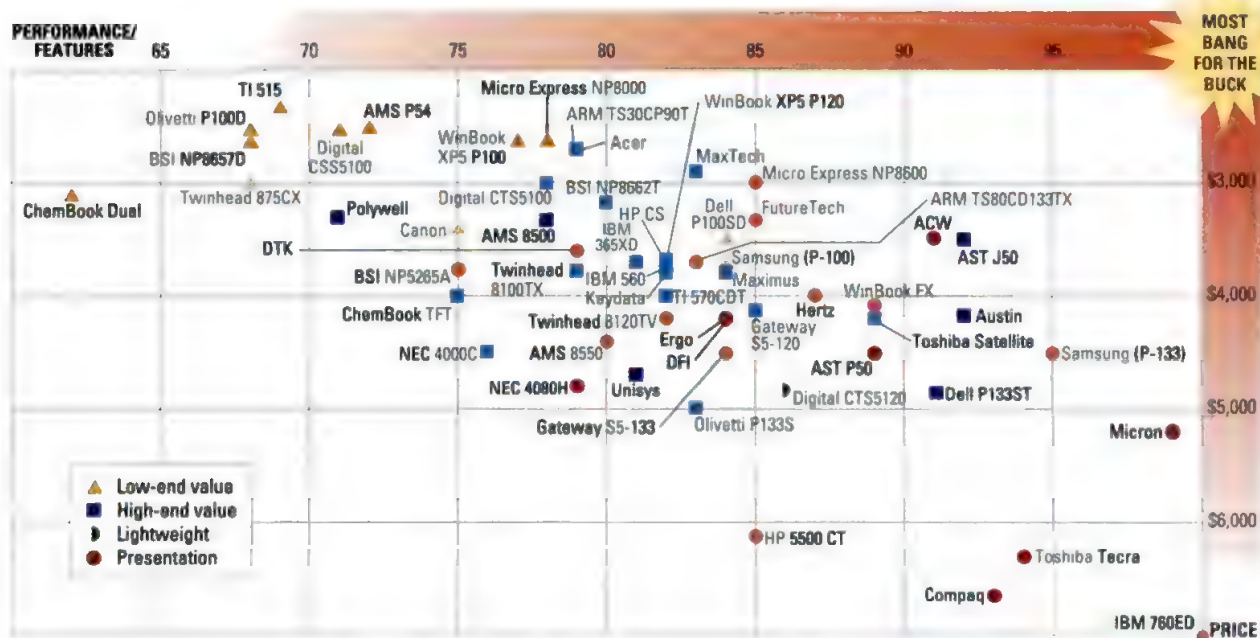
here: AST Computer's \$3,499 Ascentia J50 and Austin's \$4,171 Edge CD. The Ascentia J50 boasts a lower price and longer warranty than the Edge CD; however, it has a 10.4-inch screen, a 774MB hard disk, and no CD-ROM drive, whereas the Edge CD has an 11.4-inch display, a 1.3GB hard disk, and a 4X CD-ROM drive.

Of the two lightweights, IBM's 4.8-pound, \$3,749 ThinkPad 560, an Editors' Choice, has the better price, but Digital's 4.7-pound, \$4,799 HiNote Ultra II CTS5120 holds the performance edge.

THE DATA POINTS

Benchmark test scores account for about 40 percent of the performance/features score. Display technology, screen size, and maximum external resolutions supported make up over 15 percent. Service and support policies and other features account for the rest of the score.

Data is available in the Hardware Library of the Editorial Forum on PC MagNet under 14BANG96.TXT, and on the World Wide Web at <http://www.ziff.com/~pcmag/pclabs/pclabs.htm>.



Acer America Corp.

Acer Note Light

Acer America Corp.'s Acer Note Light is a 100-MHz Pentium-based notebook intended for busy business travelers who don't want the added weight of an internal CD-ROM drive. With its \$2,699 street price, it should also appeal to the consumer market.

The Acer Note Light has a 6.6-pound travel weight and comes with a 10.4-inch active-matrix SVGA display driven by Chips and Technologies' 65545

graphics chip set with 1MB DRAM, a 774MB hard disk, and a nickel hydride battery that gives it a competitive operating time. The unit is similar to the TI Extensa 515 (reviewed separately).

One of the major factors that keep the

Acer Note Light's performance mostly below average among the high-end value notebooks is the lack of an external processor cache. The Acer motherboard with an ALI chip set came with EDO DRAM, but the absence of an L2 cache held the Note Light to below-average results

SERVICE & RELIABILITY

Acer America Corp.

Reliability	Average
-------------	---------

Repair	Average
--------	---------

Technical support	Average
-------------------	---------

Percent needing repair	Average
------------------------	---------



Acer Note Light.

SUITABILITY TO TASK

Desktop replacement	Road warrior
Fair	Good

THANKS.

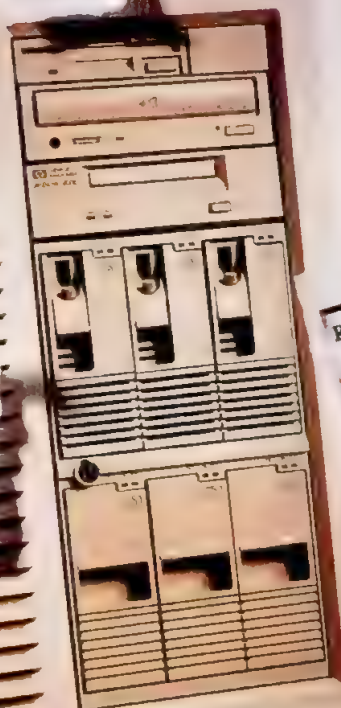
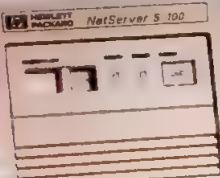
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HEWLETT
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across most of our benchmark tests. Its only average score was on our Disk WinMark 96 tests.

Many of Acer's intended customers won't mind sacrificing ultrafast performance, because they'll be enjoying long battery life: The Note Light ran for 2:59 on our BatteryMark test.

Acer's software bundle includes Sidekick 95, Quicken 96 Special Edition, and Hoyle Classic Games. The Note Light comes with a three-year warranty, a next-day replacement policy, and round-the-clock toll-free technical support but no on-site service.—*Bruce Brown*

Acer Note Light. Street price: \$2,699. Acer America Corp., San Jose, CA; 800-733-2237, 408-432-6200; fax, 408-922-2933; <http://www.acer.com/aac>. *Circle 498 on reader service card.*

All Computer Warehouse

ACW ND5123T

Targeted at the power users within the corporate, government, and education markets, All Computer Warehouse's ACW ND5123T (\$3,489 direct) is set for presentations, with a detachable 12.1-inch active-matrix NEC SVGA screen. The Pentium/133-based unit includes a 1.3GB Toshiba hard disk and a TEAC 4X CD-ROM drive. This ACW machine is similar to FutureTech's FutureMate 5813T, reviewed in this issue.

Weighing in at 8.5 pounds with battery and AC adapter, the ACW notebook is based on a Dual Technology motherboard and an SiS core-logic chip set. The notebook's impressive benchmark test performance is due in part to its 256K of pipelined-burst L2 cache and a combination of 2MB of EDO DRAM and Chips and Technologies' 65550 graphics chip set. The ND5123T's fast video memory boosted it to above-average scores on the Graphics WinMark 96 and the Winstone 96 tests. The system posted average Disk and CD-ROM WinMark 96 scores and average CPUmark scores. On our BatteryMark test, its nickel hydride battery lasted 1:28.

ACW bundles Microsoft application and entertainment software. The vendor offers limited technical support hours and a one-year parts-and-labor warranty;



SUITABILITY TO TASK

	Desktop replacement	Road warrior
ACW ND5123T	Good	Good
AMS PowerCD 8500	Good	Fair
AMS PowerCD 8550	Good	Fair
AMS SoundPro P54	Fair	Fair

two additional years of coverage, including on-site support from GE, cost \$229.95.—*BB*

ACW ND5123T. Direct price: \$3,489. All Computer Warehouse, City of Industry, CA; 800-775-1953, 818-369-4181; fax, 818-961-7462; acw@netvoyage.net. *Circle 499 on reader service card.*

AMS Tech

SoundPro P54, PowerCD 8500, PowerCD 8550

AMS has a notebook for every need. Its low-end value machine, the \$2,480, 7.7-pound Pentium/100-based SoundPro P54, offers a 10.4-inch dual-scan VGA display for basic on-the-road communications and applications work. Its high-end value unit, the \$3,325, 8.5-pound Pentium/120-based PowerCD 8500, with a 10.4-inch active-matrix SVGA screen, is for mobile corporate users who demand high-end multimedia capabilities. Finally, its presentation notebook, the \$4,395, 8.8-pound Pentium/133-based PowerCD 8550, features an 11.2-inch active-matrix SVGA display for no-compromise computing.

The SoundPro uses an AMS motherboard with an ACC Micro chip set and 256K of asynchronous L2 cache, which contributed to below-average CPUmark

scores. The Toshiba 776MB hard disk aided it in achieving an average Disk WinMark 96 score. The Chip and Technologies VL-Bus-based graphics chip set with 1MB DRAM contributed to a below-average Graphics WinMark 96 score. The unit posted average Winstone 96 and Winstone 32 scores. Its nickel hydride battery lasted a competitive 2:48 on the BatteryMark test.

Stepping up to the PowerCD 8500 will net you a 120-MHz

CPU, an ACC chip set, 256K of pipelined-burst L2 cache, PCI graphics, and the same hard disk as in the SoundPro. This unit also has a 2X CD-ROM drive. The system posted average CPUmark, Winstone, and Disk WinMark 96 scores. Even with 2MB of VRAM, its Graphics WinMark 96 score was below average, as was its CD-ROM WinMark 96 score. (Its 2X CD-ROM drive is the likely culprit for the last result.) The unit's BatteryMark score was 1:39.

The AMS PowerCD 8550 features a bigger display (11.2 inches), a 133-MHz CPU, a 1.3GB hard disk, and a 4X CD-ROM drive. Unfortunately, this machine posted below-average scores on most benchmark tests, including all CPUmark and Winstone measures as well as our Graphics WinMark 96 test. The 4X drive helped the PowerCD 8550 attain an average CD-ROM WinMark score; its Disk WinMark 96 score was also average. The unit was unable to run the BatteryMark test.

AMS sells its notebooks with a three-year parts-and-labor warranty; no on-site service is available. Live toll-free technical support is available from 8:30 to 5:30 Pacific time, Monday through Saturday.—*BB*

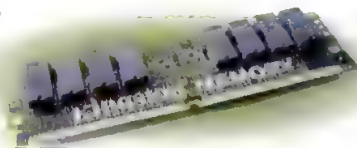
SoundPro P54. Street price: \$2,480. **PowerCD 8500.** Street price: \$3,325. **PowerCD 8550.** Street price: \$4,395. AMS Tech, Irwindale, CA; 800-886-2671, 818-814-8851; fax, 818-814-0782; <http://www.amstech.com>. *Circle 500 on reader service card.*



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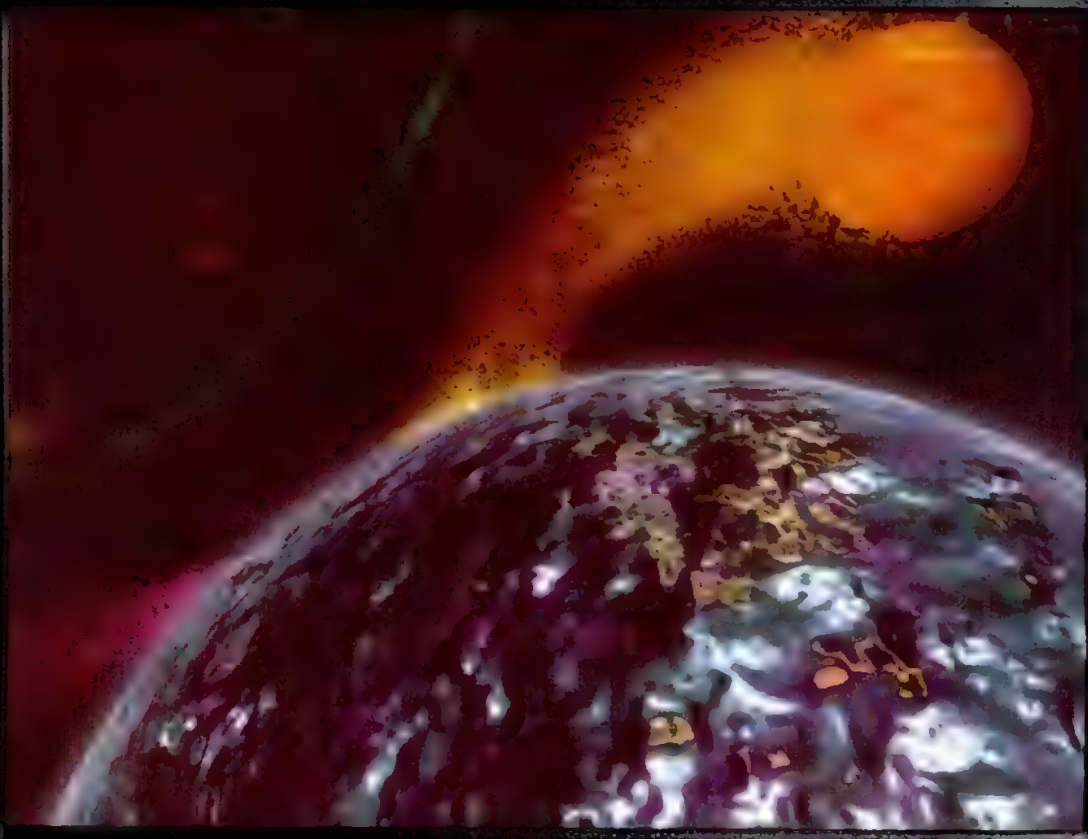
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- PCI Bus with 128-bit Graphics Accelerator
- Integrated 16-bit Stereo Sound
- Smart Lithium Ion Battery
- Touchpad/IrDA-1 Port
- Under 7 pounds*
- Extendable 1 Year Warranty†
- * Upgrade to a 1.3GB hard drive, add \$200
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DELL LATITUDE XPi P100SD

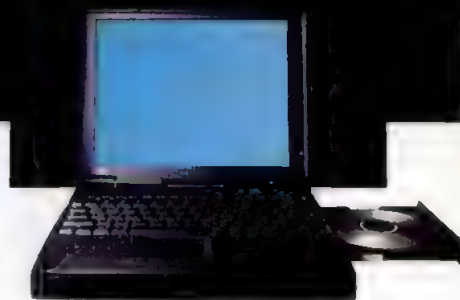
100MHz PENTIUM PROCESSOR

- NEW Network-ready Notebook
- 10.4" SVGA Dual Scan Color Display
- 8MB RAM/540MB Hard Drive
- 256KB L2 Cache
- PCI Bus with 128-bit Graphics Accelerator
- Integrated 16-bit Sound with Built-in Dual-ported Speaker
- Smart Lithium Ion Battery
- 19mm Optical Trackball
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Battery Life vs. Portability

PC Magazine Labs inaugurates a new battery test this issue: the ZD BatteryMark measure, designed to simulate the way a user would realistically use a notebook. It runs complete with the periodic "think times" that occur in a real-world situation (see the PC Tech section of this issue for more detailed information on the test).

All of the top performers on this new test used lithium ion batteries. But in terms of battery life, the clear champ is the Dell Latitude XPi P100SD, an honorable mention in this roundup. This portable kept on ticking for nearly 5 hours—which should be more than enough to last through a cross-country flight under a normal-usage scenario.

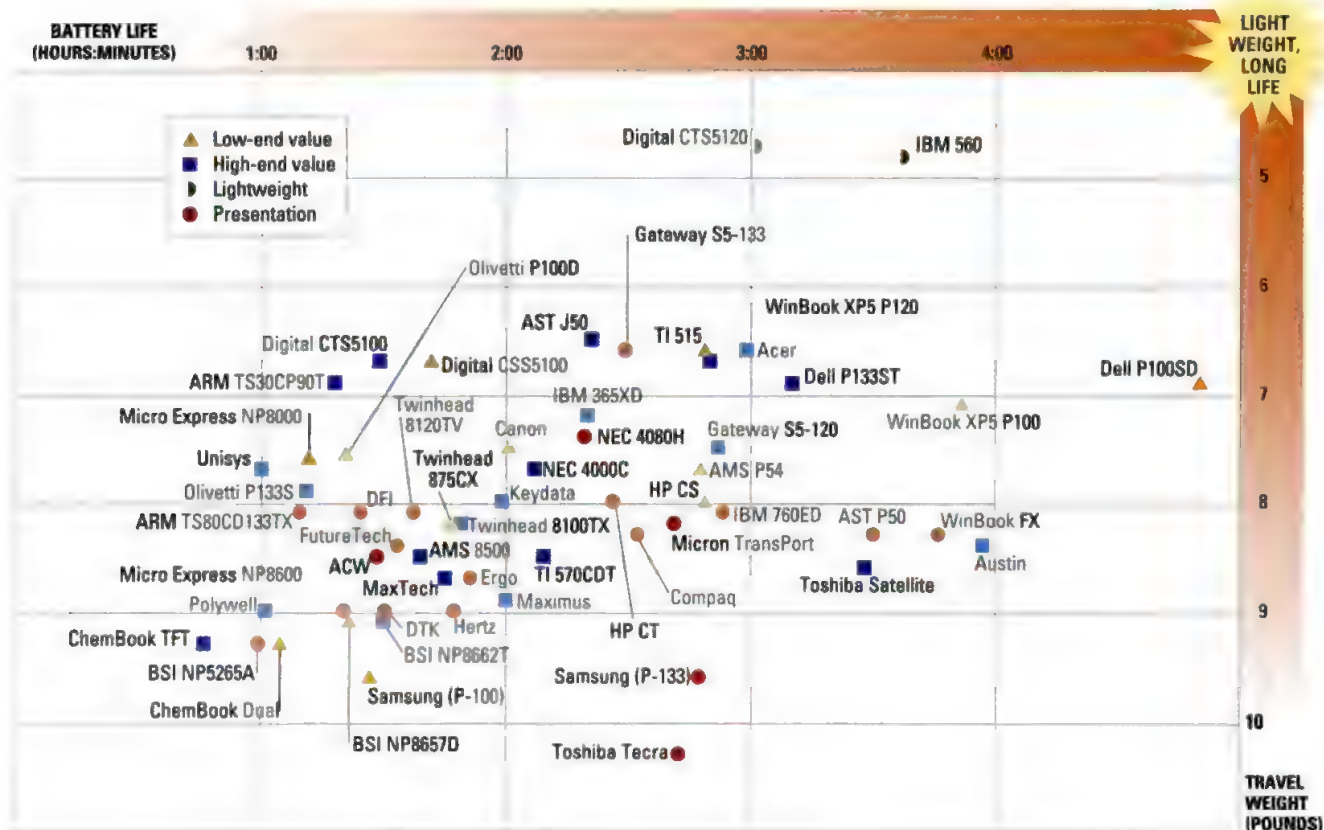
The \$3,459 Pentium/100-based Dell Latitude XPi P100SD, which weighs in at only 6.9 pounds equipped for the road, combines many of today's most

sought-after components with aggressive power management features. This system (as well as Dell's other entry, the Pentium/133-based Latitude XPi P133ST) features a well-integrated set of low-power components, including NeoMagic's 128-bit MagicGraph NM2070 graphics chip set, to reduce overall power consumption for longer battery life. The unit also offers 256K of synchronous L2 cache and 16-bit audio, as well as a 10.3-inch SVGA dual-scan display and a 773MB hard disk.

There were only two lightweight notebooks in this roundup: the \$4,799 Digital HiNote Ultra II CTS5120 and the \$3,749 IBM ThinkPad 560. The ThinkPad 560, our lightweight Editors' Choice, lasted half an hour longer (3:38) than the HiNote Ultra II's respectable 3:02. The IBM, weighing only 4.8 pounds (travel weight)

and measuring 1.3 inches thick, offers a beautiful 12.1-inch active-matrix SVGA screen and a 774MB hard disk. The Digital unit weighs a bit less (4.7 pounds) and has a bigger hard disk (1GB), but its TFT display measures 10.4 inches diagonally.

Among presentation notebooks, the leader, the \$4,079 WinBook FX, ran for 3:46 on our BatteryMark test. The closest competitor was the \$4,499 AST Ascentia P50, which ran for 3:30. All other presentation notebooks were sub-3-hour performers. These two books (as well as the Editors' Choice Austin Edge CD) are made by the same parent company, Quanta Computer Systems, and offer many of the same perks: Pentium/133 processors, EDO DRAM, Toshiba hard disks, TEAC 4X CD-ROM drives, and 11.3-inch active TFT screens.—*Analysis written by Mary E. Behr*



	Travel weight (pounds)	Main battery weight (pounds)	2D Battery Mark (hours:minutes)	Battery life per pound of battery weight (hours:minutes)
LOW-END VALUE				
AMS SoundPro P54	7.7	1.4	2:48	2:00
BSI NP6657D	9.1	1.3	1:22	1:03
Canon Innova Book 360CD	7.5	1.3	2:01	1:33
ChemBook 5400 Dual	9.3	1.1	1:05	0:59
Dell Latitude XPI P100SD	6.9	0.9	4:52	5:24
Digital HiNote VP CSS5100	6.7	1.0	1:42	1:42
HP OmniBook 5500 CS	8.0	0.9	2:40	3:08
Micro Express NP8000-P120	7.6	1.0	1:12	1:12
Olivetti Echos P100D	7.5	1.1	1:21	1:14
Samsung SENS 810 (P-100)	9.6	1.3	1:27	1:07
TI Extensa 515	6.6	1.1	2:49	2:34
Twinhead Slimnote 875CX	8.3	0.7	1:47	2:33
WinBook XP5 P100	7.1	1.0	3:52	3:52
HIGH-END VALUE				
Acer Note Light	6.6	1.1	2:58	2:43
AMS PowerCD 8500	8.5	1.0	1:39	1:39
ARMNote TS30CP90T	6.9	0.9	1:18	1:27
AST Ascentia J50	6.5	1.0	2:21	2:21
Austin Edge CD	8.4	1.2	3:57	3:18
BSI NP8662T	9.1	1.3	1:30	1:09
ChemBook 5400 TFT	9.3	1.1	0:48	0:42
Dell Latitude XPI P133ST	6.9	0.9	3:09	3:30
Digital HiNote VP CTS5100	6.7	1.0	1:29	1:29
Gateway Solo S5-120	7.5	0.9	2:52	3:11
IBM ThinkPad 365XD	7.2	1.0	2:20	2:20
Keydata Keynote GT	8.0	0.9	1:59	2:12
Maximus MediaNote CD Book	8.9	1.2	2:00	1:40
MaxTech YesBook Model X753	8.7	1.3	1:45	1:21
NEC Versa 4000C	7.7	0.8	2:07	3:32
Olivetti Echos P133S	7.9	1.0	1:11	1:11
Polywell Poly 500NB5	9.0	1.1	1:01	0:55
TI Extensa 570CDT	8.5	1.3	2:09	1:39
Toshiba Satellite Pro 420CDT	8.6	0.8	3:28	4:20
Twinhead Slimnote 8100TX	8.2	0.7	1:49	2:38
Unisys Aquanta MN	7.7	0.7	1:00	1:28
WinBook XP5 P120	6.7	1.0	2:50	2:50
LIGHTWEIGHT				
Digital HiNote Ultra II CTS5120	4.7	0.7	3:02	4:20
IBM ThinkPad 560	4.8	0.7	3:38	5:11
PRESENTATION				
ACW ND5123T	8.5	1.1	1:28	1:20
AMS PowerCD 8550	8.8	1.0	N/A	N/A
ARMNote TS80CD133TX	8.1	0.7	1:09	1:38
AST Ascentia P50	8.3	1.2	3:30	2:55
BSI NP5265A	9.3	1.1	0:59	0:53
Compaq LTE 5300	8.3	1.4	2:32	1:49
DFI 7200TC	8.1	0.7	1:24	2:00
DTK DTN-5P120C	9.0	1.3	1:30	1:09
Ergo CD-PowerBrick	8.7	1.3	1:51	1:25
FutureMate 5813T	8.4	1.1	1:33	1:25
Gateway Solo S5-133	6.6	0.9	2:29	2:46
Hertz Z-Optima NB P150c	9.0	1.3	1:47	1:22
HP OmniBook 5500 CT	8.0	0.9	2:26	2:42
IBM ThinkPad 700ED	8.1	0.7	2:53	4:07
Micro Express NP8600-P120	9.0	1.3	1:20	1:02
Micron Millennia TransPort	8.3	1.0	2:41	2:41
NEC Versa 4080H	7.4	0.8	2:19	3:52
Samsung SENS 810 (P-133)	9.6	1.3	2:47	2:08
Toshiba Tecra 720CDT	10.3	1.3	2:42	2:05
Twinhead Slimnote 8120TV	8.1	0.7	1:37	2:19
WinBook FX	8.3	1.2	3:46	3:08

N/A—Not applicable: This product could not perform the 2D BatteryMark test.

ARM Computer Inc.

ARMNote TS30CP90T, ARMNote TS80CD133TX

ARM Computer has two solid choices for the corporate customer. The ARMNote TS30CP90T, a Pentium/90-based high-end value unit with a 6.9-pound travel weight, a 10.4-inch active-matrix display, and a 774MB hard disk, has a direct price of \$2,699. In the presentation category, the \$3,699 ARMNote TS80CD133TX offers a 133-MHz Pentium processor, a 1.3GB hard disk, and a Matsushita 4X CD-ROM drive for more demanding users. Both machines were mostly average performers on our benchmark tests, but the battery life for each is short.

The TS30CP90T, with a Compaq motherboard, a VLSI chip set, and a 256K pipelined-burst L2 cache, posted average scores on most tests but dipped below average on our Disk WinMark 96 and CPUmark₁₆ tests. The BatteryMark score with the included nickel hydride battery was 1:18.

The TS80CD133TX, manufactured by Twinhead, is essentially the same as Twinhead's three entries in this roundup, as well as Diamond Flower Instrument's DFI 7200TC (also reviewed in this roundup). Using an SiS chip set and 256K of synchronous L2 cache, the TS80CD-133TX posted average scores on our Winstone 32, Disk WinMark 96, CD-ROM WinMark 96, and CPUmark tests. The system's Cirrus Logic graphics chip set with 1MB VRAM resulted in below-average Graphics WinMark 96 and Winstone



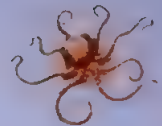
SUITABILITY TO TASK

	Desktop replacement	Road warrior
ARMNote TS30CP90T	Fair	Fair
ARMNote TS80CD133TX	Good	Fair

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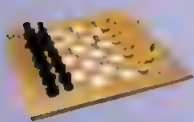


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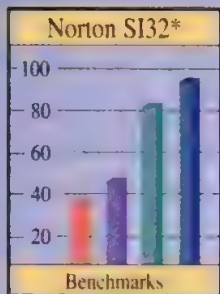
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96 scores. The lithium ion battery lasted just over 1 hour on the BatteryMark test.

The TS80CD133TX includes two extra features of note: NTSC video-out ports and Lotus SmartSuite 96 for Windows 95. An optional docking station with two drive bays and two ISA card slots costs \$499.

ARM includes a one-year-parts and three-years-labor warranty. Limited toll-free technical support is available.—**BB**
ARMNote TS30CP90T. Direct price: \$2,699.
ARMNote TS80CD133TX. Direct price: \$3,699. ARM Computer Inc., Milpitas, CA; 800-765-1767, 408-935-9800; fax, 408-935-9192. Circle 501 on reader service card.

AST Computer

Ascentia J50, Ascentia P50



AST Computer comes on strong with its Ascentia notebooks. At \$3,499 (street), the 6.5-pound Pentium/133-based Ascentia J50, an Editors' Choice in this roundup with a 774MB hard disk and a 10.4-inch active-matrix display, is intended for users with demanding applications that require a high-performance system. It falls into our high-end value category and is similar to Austin's Edge CD and the WinBook FX, also reviewed in this roundup. The top model, the Ascentia P50, is an 8.3-pound Pentium/133-based system with a street price of \$4,499. Its target market, users needing a presentation notebook or desktop replacement, will be well served by its 11.3-inch active-matrix SVGA display, 774MB hard disk, and internal 4X CD-ROM drive.

Both AST notebooks have internal modems—a 14.4-Kbps model in the J50 and a 28.8-Kbps model in the P50; both also have lithium ion batteries. Another AST model, the Ascentia J30, not reviewed here, with the same configuration as the J50 except for a 100-MHz processor and a dual-scan screen, sells for \$2,699.

The Ascentia J50's Compal motherboard with Intel mobile Triton 430MX chip set and 256K pipelined-burst cache and EDO DRAM contributed to above-average scores on every benchmark test in

its high-end value category. The J50's Chips and Technologies graphics chip set with 1MB DRAM gets some of the credit for these impressive test scores. On our BatteryMark test, the unit lasted for 2:21.

The Ascentia P50 uses a Quanta motherboard with Intel's 8Z430MX chip set, 256K of L2 cache, and EDO DRAM. These components worked well for the unit, helping it to attain an above-average mark on the CPUmark₁₆ tests within the presentation category. It posted average scores on the Winstone 32, Winstone 96, Graphics WinMark 96, and Disk WinMark 96 tests and a below-average mark on the CD-ROM WinMark 96 measure. The P50's battery life was very impressive: 3:30 on our BatteryMark test.

SERVICE & RELIABILITY

AST Computer	
Reliability	Worse than average
Repair	Average
Technical support	Average
Percent needing repair	Average

AST's standard parts-and-labor warranty for the Ascentias is for three years. On-site service is \$60 for one year or \$198 for three years. The company also has 24-hour, 7-day toll-free technical support.—**BB**

Ascentia J50. Street price: \$3,499. **Ascentia P50.** Street price: \$4,499. AST Computer, Irvine, CA; 800-876-4278, 714-727-4141; fax, 714-727-9355; <http://www.ast.com>. Circle 502 on reader service card.

Austin Computer Systems

Austin Edge CD



The \$4,171 Edge CD, from Austin Computer Systems, is a Pentium/133-based high-end value notebook with all the trimmings. One of our Editors' Choices in the high-end value category, this 8.4-pound notebook, featuring an 11.4-inch active-matrix SVGA screen, is designed for the business traveler. It is similar to the AST Ascentia P50 and the WinBook FX, also reviewed in this roundup.



AST P50, Austin.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
AST Ascentia J50	Good	Good
AST Ascentia P50	Good	Good
Austin Edge CD	Good	Good

The Edge CD's lithium ion battery lasted 3:57 in our BatteryMark test, proving that it's able to endure a cross-country flight on a single battery. Thanks to 256K of pipelined-burst external processor cache, the Edge's performance numbers ranged from average to slightly above average: Winstone 96, Winstone 32, CPUmark₁₆, and CPUmark₃₂ scores were above average; Graphics, Disk, and CD-ROM WinMark 96 scores were average.

Mobile professionals will appreciate the modular design of the Austin Edge CD. The floppy disk drive can be swapped out to accommodate a 4X CD-ROM drive or a second battery. (A 6X CD-ROM drive will be standard by the time this review hits the newsstand.) In case you need to swap out the hard disk regularly, the system's 1.3GB Toshiba drive can be removed easily.

The system also includes a 28.8/14.4-Kbps fax modem, which leaves both PC Card slots open for other devices. The Edge CD comes with an infrared port as well as the standard parallel, serial, and PS/2 ports.

Austin Direct provides a one-year parts-and-labor warranty and round-the-clock technical support for its notebook.—**Charles Lin**

Austin Edge CD. Street price: \$4,171. Austin Computer Systems, Austin, TX; 800-752-1577, 512-339-3500; fax, 512-454-1357; <http://www.austindirect.com>. Circle 503 on reader service card.



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- 5-year/3-year Micron Power limited warranty*

† 6.9 lbs. includes 3.5" floppy and one battery
†† Lock secures both Millennium TransPort and 2nd MicroDock

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- 1.2GB removable hard drive
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- Motorola Montana 28.8 fax/modem
- 12.1" active matrix color display, 800 x 600
- 1.2GB removable hard drive
- 2nd intelligent modular lithium-ion battery

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HOME MPC P133

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- PCI 64-bit 3D video, MPEG, 2MB EDO
- 15" Micron 15FGx, 28dp (13.7" display)
- Tool-free minitower or desktop
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HOME MPC P133

HOME MPC P166

- Intel 166MHz Pentium processor
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- 16-bit 3D WaveTable stereo sound card
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- PCI 64-bit 3D video, MPEG, 2MB EDO
- 17" Micron 17FGx, 26dp (15.8" display)
- Tool-free minitower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows 95 & MS Plus! CD
- Microsoft Office Pro 95 & Bookshelf 95 CDs
- Quicken Financial Pak includes: Quicken Deluxe
5.0; Quicken Financial Planner; Quicken Parents'
Guide to Money; Quicken Family Lawyer
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Windows 95; Publisher Deluxe for Windows
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Central 96; Wine Guide; Arcade 1.0; Scenes—
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- 5-year/3-year Micron Power warranty*

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Broadax Systems Inc.

BSI NP8657D, BSI NP8662T, BSI NP5265A

Broadax Systems offers computers for a broad range of users, from students to corporate customers. Each of the three systems reviewed here includes a PC Card V.34 fax modem and a 4X CD-ROM drive. The Pentium/75-based BSI NP8657D low-end value unit is \$2,605 (street price). The Pentium/120-based BSI NP8662T high-end value unit is \$3,170 and is essentially the same as the DTK DTN-5P120C and the Micro Express NP8600-P120, also reviewed in this roundup. The Pentium/150-based BSI NP5265A presentation unit is \$3,765 and is the same as the Chem USA ChemBook 5400 TFT and the Polywell Poly 500NB5—also in this roundup.

The BSI NP5265A weighs 9.3 pounds, including the AC adapter. Unique among the three BSI machines are its 12.1-inch active-matrix display and a wrist rest that features an embedded touch pad and joystick. The system also includes a 1.3GB hard disk, a game/MIDI port, and an infrared port.

The NP5265A has 256K of asynchronous L2 cache; most other systems in this roundup use pipelined-burst cache, which is partly why all the NP5265A's scores were below average except the CD-ROM WinMark 96 score, which was average. The NP5265A uses a nickel hydride battery that lasted only 0:59 on our BatteryMark test, one of the shortest times of all the systems we tested.

The high-end NP8662T and the low-end NP8657D share the same case design and the same configuration of PC Card slots. The NP8662T has a 10.4-inch active-matrix display and a 1.3GB hard disk; the NP8657D uses an 11.3-inch dual-scan color display and a 772MB hard disk. Using a Duracell nickel hydride battery, the NP8662T scored 1:30 on the BatteryMark test; the NP8657D scored 1:22.

These two systems use 256K of synchronous L2 cache. The NP8662T's test scores were average except for the CD-ROM WinMark 96 result, which was above average. The NP8657D's Disk and CD-ROM WinMark 96 scores were

average; its Winstone, Graphics WinMark 96, and CPUmark scores were all below average. The travel weight of each system is 9.1 pounds.

All three systems are backed by a one-year parts-and-labor warranty.—*CL*

BSI NP8657D. Street price: \$2,605. **BSI NP8662T.** Street price: \$3,170. **BSI NP5265A.** Street price: \$3,765. Broadax Systems Inc., El Monte, CA; 800-872-4547, 818-442-0020; fax, 818-442-4527; BSI@earthlink.net. *Circle 504 on reader service card.*

Canon Computer Systems Inc.

Innova Book 360CD

Canon Computer Systems' \$3,369 Innova Book 360CD is the only unit in this roundup based on AMD's Am5x86-P75 processor, which runs at 133 MHz but competes with Intel's 75-MHz Pentium. Canon, known for breaking ground in 1995 with an ink jet printer-equipped notebook, markets the printerless low-end value Innova Book as a budget system for users who want multimedia functions.

The Innova Book has a travel weight of 7.5 pounds. Its features include a 10.4-inch dual-scan VGA color display, a 776MB hard disk, and integrated 16-bit FM synthesis. The 4X CD-ROM drive can be swapped for a 1.44MB floppy disk drive. A 28.8-Kbps PC Card fax modem is also included. The unit offers a docking station connection and an IrDA-standard infrared port as well as the standard I/O ports.

The Innova Book's 64-bit VL-Bus graphics subsystem is based on 1MB of VRAM and a Chips and Technologies 65545 graphics chip set. All its Winstone and CPUmark scores as well as its Graphics WinMark 96 score were below average. Its Disk and CD-ROM WinMark 96 test results were average. The unit's nick-



BSI NP8657D, Canon, ChemBook TFT.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
BSI NP5265A	Good	Fair
BSI NP8657D	Good	Fair
BSI NP8662T	Good	Good
Canon Innova 360CD	Good	Good
ChemBook 5400 Dual	Good	Fair
ChemBook 5400 TFT	Good	Fair

el hydride battery lasted 2:01 on our BatteryMark test.

The Innova Book comes with an extensive bundle of useful on-the-road software. Canon backs this unit with a one-year mail-in parts-and-labor warranty. Telephone technical support is available 18 hours, 7 days.—*Robert S. Anthony*
Innova Book 360CD. Street price: \$3,369. Canon Computer Systems Inc., Costa Mesa, CA; 800-848-4123; fax, 408-945-1135; <http://www.ccsi.canon.com>. *Circle 505 on reader service card.*

Chem USA Corp.

ChemBook 5400 Dual, ChemBook 5400 TFT

Chem USA Corp.'s notebooks offer large screens but were poor performers. The \$3,075 low-end value Pentium/75-based ChemBook 5400 Dual and the \$4,000 high-end value 150-MHz Pentium ChemBook 5400 TFT both weigh 9.3 pounds. The notebooks are manufactured by Kapok Computer Co.; the 5400TFT has the same case design as the BSI NP5265A and the Polywell Poly 500NB5.

The 5400 Dual 75-MHz system has a Kapok motherboard based on a UMC chip set. Asynchronous L2 cache (256K) and conventional DRAM hold performance

BENCHMARK TESTS

Pentium Notebooks



This roundup of 58 notebooks marks the debut of some new performance-enhancing components including 128-bit graphics engines, 6X CD-ROM drives, and Intel's mobile Triton chip set. Finally, we introduce our new battery benchmark test, ZD BatteryMark.

What the Numbers Mean

ZD Winstone 96 and ZD Winstone 32 More powerful CPUs, pipelined-burst L2 cache, and faster graphics accelerators helped set records on our Winstone 96 benchmark tests. Six notebooks, all 133-MHz Pentiums, beat the old Winstone 96 record of 50, set by the HP OmniBook 5000 CTS (Pentium/120) in our last notebook roundup ("On the Road with the Pentium," January 23, 1996).

In a sea of Intel processors, the low-end value Canon Innova Book 360 CD stood out with its AMD Am5x86-P75. The 5x86 is really a DX4/133: It runs internally at 133 MHz and externally at 33 MHz. Through the use of the P-rating system, AMD is able to call the chip a P75 because it provides system performance on a par with a Pentium/75 CPU. The P-rating claim holds true as the four Pentium/75 systems in this roundup had Winstone 96 scores averaging 31, while the Canon notebook posted a score of 34.

Three systems in this roundup used Pentium/150 processors: the presentation BSI NP5265A, high-end value ChemBook 5400 TFT, and presentation Hertz Z-Optima NB P150c. Many notebook manufacturers are waiting for Intel to implement its VRT (Voltage Reduction Technology) in a Pentium/150 CPU, which will allow the chip to run at a lower voltage, consume less battery power, and run cooler. The implementations of the Pentium/150 processors on the three notebooks were deficient, however, as the average Pentium/133, Pentium/120, or even Pentium/100 was able to beat the poorest performing Pentium/150 we tested on Winstone 32. The averages broke down in the following manner: The P/150s and P/100s tied at 41, the P/120s averaged 42, and the P/133s, 47.

The two Digital HiNote VP units produced unstable benchmark test results through multiple test runs. We discovered that the variances were due to Digital's implementation of Active Thermal Feedback (ATF), a feature developed by Digital in conjunction with Intel and implemented through the Intel 430MX chip set. Using a thermal sensor placed underneath the CPU, the chip set can track the CPU's temperature. If the CPU is deemed too hot, ATF will clock the CPU down to as little as one-fifth of its rated speed. Digital claims that ATF will improve system reliability over time.

Our testing showed that ATF was active at various unpredictable times during test runs, resulting in wide variances among scores (Winstone test scores varied from 17 to 39 percent). We report the highest scores achieved for each test run.

We believe that our testing does not push notebooks so hard as to produce excessive heat. We also believe that users are likely to experience performance swings with the HiNote VP units. Usage

scenarios that tax the CPU heavily (such as compiling a program or rendering a 3-D image) will certainly heat up the CPU; however, both HiNote VPs produced lower scores when they had been sitting idle on AC power all night and then tested in the morning. This scenario is not unlike a system sitting on your desk plugged in all day, its CPU clocking down because of heat buildup, even when the system has been idle for most of the day.

ZD Graphics WinMark 96 and ZD Disk WinMark 96 The use of 32-bit graphics engines has long been a key stumbling block on the road to achieving desktop-level performance from a notebook. In this roundup we see not only two different 64-bit graphics chip sets but a 128-bit chip set as well. The Chips and Technologies 65550 and the Trident Cyber9382 and Cyber9385 represent the first 64-bit graphics accelerators here, while the NeoMagic MagicGraph NM2070 pushes the envelope further with a 128-bit design.

Notebooks in this roundup set new record scores on Graphics WinMark 96 with the help of more powerful processors. The ThinkPad 760ED used the Trident Cyber 9385 graphics chip set to power it to a record Graphics WinMark 96 score of 17.1. The Trident Cyber 9382 and Cyber 9385 chip sets each feature a 64-bit

ZD Winstone 96

Bold type denotes first place within each category.

Score

LIGHTWEIGHT

Digital HiNote Ultra II CTS6120 (Pentium/120)

41

IBM ThinkPad 560 (Pentium/120)

37

PRESENTATION

ACW NQ5123T (Pentium/133)

53

AMS PowerCD 8550 (Pentium/133)

39

ARMNote TS80CD133TX (Pentium/133)

41

AST Ascendix P50 (Pentium/133)

46

BSI NP5265A (Pentium/150)

39

Compaq LTE 5300 (Pentium/133)

47

DFI 7200TC (Pentium/133)

40

DTK DTN-5P120C (Pentium/120)

43

Ergo CD-PowerBrick (Pentium/120)

44

FutureMate 5813T (Pentium/133)

52

Gateway 2000 S5-133 (Pentium/133)

46

Hertz Z-Optima NB P150c (Pentium/150)

47

HP OmniBook 5500 CT (Pentium/133)

49

IBM ThinkPad 760ED (Pentium/133)

37

Micro Express NP8800-P125 (Pentium/120)

43

Milken Multimedia TransPort (Pentium/133)

34

NEC Versa 4080H (Pentium/120)

30

Samsung SENS 810 (Pentium/133)

48

Toshiba Tecra 720COT (Pentium/133)

46

Twinhead Slimnote 8120TV (Pentium/120)

44

WinBook FX (Pentium/133)

48

BETTER ►

N/A—Not applicable: The product could not perform this test.

GUI engine, a 64-bit memory interface that supports EDO DRAM, and an integrated RAMDAC. For video tasks, both also support YUV-to-RGB color-space conversion and bilinear horizontal and vertical interpolated scaling. In addition, the Cyber 9385 supports flicker-free, NTSC/PAL-compliant television output.

The ACW ND5123T and the FutureMate 5813T notebooks (both in the presentation category) each used the Chips and Technologies 65550 chip set and posted Graphics WinMark scores that placed them right behind the ThinkPad 760ED and the high-end value Dell Latitude XPi P133ST. The Chips and Technologies 65550 has a 64-bit graphics engine, 64-bit memory interface, horizontal and vertical interpolation, and an NTSC and PAL video decoder.

Both Dell entries—the Latitude XPi P133ST and the low-end value Latitude XPi P100SD—used the NeoMagic MagicGraph NM2070 graphics chip set. This chip set touts two key features:



The new ZD BatteryMark test gauges battery life under typical usage scenarios.

power conservation and fast graphics performance. In both cases these claims seem to be true. Both Dell notebooks finished first in their respective categories on our Graphics WinMark tests, and the P100SD was also the top performer on our BatteryMark test. The NeoMagic MagicGraph NM2070 is a single-chip solution, which integrates the graphics engine, RAMDAC, and 1MB of DRAM memory. This high level of integration, combined with a 128-bit graphics engine and 128-bit memory path, are what give the chip its top-flight performance.

Hard disk performance in notebooks is slowly catching up to that in desktops. A major hindrance to breakneck performance is spindle speeds. On the desktop, 7,200-rpm Fast/Wide SCSI-2 disks are currently the top

performers. For IDE disks in desktop PCs, top performance is gained from 5,400-rpm disks. In the notebook arena, the fastest

Continues

ZD Winstone 32	ZD Graphics WinMark 96	ZD Disk WinMark 96	ZD CPUmark₁₆	ZD CPUmark₃₂	ZD BatteryMark
Score	Millions of pixels per second	Score	Score	Score	Hours:minutes
48	10.5	662	169	155	3:02
47	9.2	605	178	172	2:38
51	14.8	644	237	231	1:28
46	8.6	594	175	164	N/A
52	9.8	593	224	220	1:08
55	11.3	670	247	236	2:30
44	9.3	580	161	148	0:59
55	10.9	624	235	220	2:32
57	11.0	643	228	221	1:24
49	11.8	589	193	182	1:30
53	9.9	592	212	210	1:51
80	15.0	615	238	230	1:31
54	11.5	647	223	214	2:29
56	10.2	635	233	224	1:47
57	13.1	643	233	234	2:26
73	17.1	643	257	253	2:53
50	11.4	573	186	180	1:20
67	12.3	770	247	248	2:41
45	10.3	622	148	134	2:19
64	6.7	562	273	278	2:47
54	12.7	606	251	247	2:42
92	10.2	572	204	200	1:37
59	10.8	534	253	244	2:48

BETTER ►

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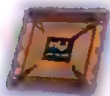


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CIRCLE 379 ON READER SERVICE CARD

BENCHMARK TESTS

Continued

disks spin at a comparatively slow 4,900-rpm (the fastest drive we saw in our issue of January 23, 1996). The IBM DPRA-20810 and 21215, which are 4,900-rpm disks, were used in only six systems. Four of the top six performers on our Disk WinMark tests among low-end value, high-end value, and presentation systems all used these IBM hard disks.

ZD CPUmark₁₆ and ZD CPUmark₃₂

L2 cache, once rarely seen in notebooks, is now widely used: Only 9 of the 58 portables that we tested for this roundup did not have L2 cache. In addition, 40 of the reviewed systems had the faster pipelined-burst or synchronous L2 cache instead of the slower asynchronous variety. Also, 24 systems made use of EDO DRAM, which provides a performance boost over standard fast-page-mode DRAM. The Pentium/133-based Samsung SENS 810 (a presentation unit) used the mobile Triton chip set, 256K of pipelined-burst L2 cache, and EDO DRAM to come away with the top CPUmark₁₆ score of 273 and top CPUmark₃₂ score of 279.

This roundup marks the introduction of the Intel mobile Triton (82430MX) chip set, used by 11 machines. The mobile Triton supports EDO DRAM, pipelined-burst L2 cache, and Enhanced-IDE modes 3 and 4. The major difference between Intel's mobile Triton and its Triton chip set for desktop PCs is that the mobile Triton supports Advanced Power Management features including auto-clock throttle, CPU clock control for thermal management, suspend, standby, and PCI power management. Systems using the mobile Triton tended to be our top CPUmark performers.

The Canon Innova Book used the AMD Am5x86-P75 processor. As stated previously, the 5x86 is really a DX4/133 that should give system performance equivalent to that of a Pentium/75-equipped machine. On CPUmark performance, the AMD chip did not quite live up to its name. The Innova Book posted scores that were about 3 percent lower than those of the average Pentium/75 on the CPUmark₃₂ test and about 10 percent lower on the CPUmark₁₆ test.

ZD BatteryMark

For this issue we introduce our new BatteryMark benchmark test. (For more information about this new test, see Lab Notes in the PC Tech section of this issue.) Employing a constant-usage scenario, the BatteryMark benchmark test evaluates a notebook with its power-management features enabled. The unit being tested runs through work periods and "think" periods where the system is idle. The screen remains active throughout the entire test. We believe that this scenario represents a work pattern typical of someone on a cross-country flight. The numbers reported are representative of how much actual and constant usage you can receive from the system. Actual user results will vary due to different power conservation settings.

The top nine systems on our BatteryMark test all used lithium ion batteries. In fact, 27 out of the 58 systems here used lithium ion batteries—up from 16 out of 41 in our last notebook roundup (January 23, 1996). While the shortage of lithium ion batteries is easing, they still cost more than nickel hydride battery packs.

The top performer on our BatteryMark test was the Dell Latitude XPI P100SD. With nearly 5 hours of life, it should last for the duration of a cross-country flight, allowing for breaks. Dell attributes its notebook's long battery life to low-powered components including the NeoMagic MagicGraph graphics chip set.

ZD CD-ROM WinMark 96 and Multimedia Tests CD-ROM

Continues

ZD Winstone 96

Bold type denotes first place within each category.

Score

LOW-END VALUE

AMS SoundPro P54 (Pentium/100)	39	
BSI NP8657D (Pentium/75)	33	
Canon Innova Book 360CD (AMD 5x86-P75)	34	
ChemBook 5400 Dual (Pentium/75)	26	
Dell Latitude XPI P100SD (Pentium/100)	47	
Digital HiNote VP CSS5100 (Pentium/100)*	35	
HP OmniBook 5500 CS (Pentium/100)	43	
Micro Express NP8000-P120 (Pentium/120)	43	
Olivetti Echos P100D (Pentium/100)	34	
Samsung SENS 810 (Pentium/100)	42	
TI Extensa 515 (Pentium/100)	34	
Twinhead Slimnote 875CX (Pentium/75)	31	
WinBook XP5 P100 (Pentium/100)	45	

HIGH-END VALUE

Acer Note Light (Pentium/100)	39	
AMS PowerCD 8500 (Pentium/120)	40	
ARMNote TS30CP90T (Pentium/90)	42	
AST Ascentia J50 (Pentium/133)	56	
Austin Edge CD (Pentium/133)	48	
BSI NP8662T (Pentium/120)	43	
ChemBook 5400 TFT (Pentium/150)	39	
Dell Latitude XPI P133ST (Pentium/133)	53	
Digital HiNote VP CTS5100 (Pentium/100)*	42	
Gateway Solo S5-120 (Pentium/120)	44	
IBM ThinkPad 365XD (Pentium/120)	42	
Keydata Keynote GT (Pentium/120)	43	
Maximus MediaNote CD Book (Pentium/133)	39	
MaxTech YesBook Model X753 (Pentium/120)	44	
NEC Versa 4000C (Pentium/75)	34	
Olivetti Echos P133S (Pentium/133)	46	
Polywell Poly 500NB5 (Pentium/133)	36	
TI Extensa 570CDT (Pentium/100)	42	
Toshiba Satellite Pro 420CDT (Pentium/100)	44	
Twinhead Slimnote 8100TX (Pentium/100)	43	
Unisys Aquanta MN (Pentium/120)	38	
WinBook XP5 P120 (Pentium/120)	44	

BETTER ►

*We tested this notebook several times, and we report the highest score achieved in each instance.

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BENCHMARK TESTS

▲ Higher scores represent better performance.
▼ Lower scores represent better performance.
Bold type denotes first place within each category.

	ZD CD-ROM WinMark 96	Sequential 18X Read	CD-ROM Access Time	CPU Utilization	HIGH-QUALITY ACTION INDEO ¹	FULL-SCREEN SCALING ²	MEDIUM-QUALITY ACTION CINEPAK ³			
▲ Higher scores represent better performance. ▼ Lower scores represent better performance. Bold type denotes first place within each category.	Score ▲	KBps ▲	ms ▼	▼	Frames Dropped ▼	CPU Utilization ▼	Frames Dropped ▼	CPU Utilization ▼	Frames Dropped ▼	CPU Utilization ▼
PRESENTATION										
ACW ND5123T (Pentium/133)	425	611	284	52%	0	80%	0	73%	0	56%
AMS PowerCD 8550 (Pentium/133)	393	613	232	45%	298	99%	328	96%	0	77%
ARMNote TS00CD133TX (Pentium/133)	384	601	235	45%	186	99%	327	92%	0	77%
AST Ascentia P50 (Pentium/133)	359	612	272	51%	12	84%	317	99%	0	62%
BSI NP5265A (Pentium/150)	422	613	280	40%	80	99%	406	96%	0	71%
Compaq LTE 5300 (Pentium/133)	409	613	303	30%	0	88%	338	89%	0	61%
DFI 7200TC (Pentium/133)	390	601	229	32%	0	95%	303	99%	0	68%
DTK DTM-5P120C (Pentium/120)	404	612	189	41%	0	84%	306	99%	0	56%
Ergo CD-PowerBrick (Pentium/120)	410	613	271	32%	0	99%	400	99%	0	86%
FutureMate 5813T (Pentium/133)	435	612	284	51%	0	90%	0	75%	0	60%
Gateway Solo S5-133 (Pentium/133)	388	601	241	33%	0	86%	396	100%	0	72%
Hertz Z-Optima NB P150c (Pentium/150)	412	614	267	33%	0	99%	403	96%	0	68%
HP OmniBook 5500 CT (Pentium/133)	459	614	207	44%	0	88%	228	99%	0	57%
IBM ThinkPad 760ED (Pentium/133)	422	613	263	32%	0	83%	88	100%	0	66%
Micro Express NP8000-P120 (Pentium/120)	457	615	195	42%	0	96%	316	99%	0	58%
Micron Millennia TransPort (Pentium/133)	498	918	224	53%	0	78%	433	99%	0	59%
NEC Versa 4860H (Pentium/120)	363	612	277	45%	194	99%	290	99%	0	66%
Samsung SENS 810 (Pentium/133)	471	612	196	23%	0	93%	405	99%	0	69%
Toshiba Tecra 720CDT (Pentium/133)	598	906	185	66%	0	82%	419	96%	0	67%
Twinhead Slimnote 8120TV (Pentium/120)	385	604	232	47%	206	99%	343	99%	0	70%
WinBook FX (Pentium/133)	417	612	258	32%	0	79%	321	96%	0	58%

(1) With an Action, Indeo, 320 x 240, 30-fps, 800-KBps clip.

(2) With an Action, Indeo, 160 x 120, 30-fps, 300-KBps clip scaled to full screen (1,024 x 768).

(3) With an Action, Cinepak, 320 x 240, 30-fps, 300-KBps clip.

Continued

drives have become a fundamental part of notebooks. Whether as an option or an integrated component, 46 out of the 58 systems had CD-ROM drives. Five of the systems came with 6X drives, while only one came with the slower 2X drive. Most systems handled our multimedia video clips without much trouble. The Full-Screen Scaling test, however, which uses an Action Indeo clip, was where most systems had trouble. Standout performers on this test were two of the IBM systems tested, both of which used Trident graphics chips. The ThinkPad 760ED used the Trident Cyber9385 chip, and the ThinkPad 365XD used the Trident Cyber9320 chip. These chips have video scaling built in to boost performance.—*Analysis by Richard Fisco*

How We Tested

We tested all notebooks with 16MB of RAM and 700MB hard disks or larger. We used each vendor's preinstalled graphics driver for either 800-by-600 or 640-by-480 resolution (depending on what the display could handle) with 256 colors and small fonts. We also disabled power-management features and removed unnecessary drivers. We defragmented hard disks before each test and let Windows 95 manage virtual memory settings.

We used our **ZD Winstone 96, Version 1.0**, benchmark test suite to measure the machines' performance when running typical Win-

dows applications. Winstone 96 measures the time a PC takes to execute a set of application scripts that exercise 13 of the best-selling Windows applications. Winstone weights a given PC's test timings based on the applications' market share; it derives a composite number and converts it to a relative score. (The score is relative to the performance of a 486SX/25 Dell 425s/P with 8MB of RAM, whose score is defined as 10.)

We also used our benchmark test suite **ZD Winstone 32, Version 1.0**, to measure units' performance when running 32-bit Windows applications. Winstone 32 measures the time a PC takes to execute a set of scripts that utilize eight best-selling 32-bit applications. Like Winstone 96, Winstone 32 then weights a given PC's test timings based on the market share of the applications and converts it to a relative score. Both Winstone tests use the same reference machine—the Dell 425s/P—whose score is defined as 10. The Winstone 32 reference system, however, runs Windows 95 and MS-DOS 7.0, while the Winstone 96 reference system runs Windows 3.1 and MS-DOS 6.2.

We used our benchmark test suite, **ZD WinBench 96, Version 1.0**, as a measure of graphics, disk, processor, CD-ROM, and motion-video performance under Windows. The **ZD Graphics WinMark 96** score, a number based on 115 tests of Windows GDI functions, represents the performance of each machine's graphics subsystem under Windows. The **ZD Disk WinMark 96** score, based on extensive application profiling,

		CD-ROM			HIGH-QUALITY ACTION INDEO ¹		FULL-SCREEN SCALING ²		MEDIUM-QUALITY ACTION CINEPAK ³	
	ZD CD-ROM WinMark 96 Score	Sequential 16K Read KBps	Access Time ms	CPU Utilization	Frames Dropped	CPU Utilization	Frames Dropped	CPU Utilization	Frames Dropped	CPU Utilization
LOW-END VALUE										
BSI NP8657D (Pentium/75)	446	613	198	46%	252	99%	403	97%	0	69%
Canon Innova Book 360CD (AMD 5x86-P75)	416	615	273	37%	0	95%	175	99%	0	67%
ChemBook 5400 Dual (Pentium/75)	406	612	273	46%	224	99%	447	99%	0	84%
HP OmniBook 5500 CS (Pentium/100)	459	615	210	45%	0	89%	263	99%	0	56%
Micro Express NP8000-P120 (Pentium/120)	397	613	283	38%	58	99%	320	99%	0	68%
Samsung SENS 810 (Pentium/100)	462	611	199	23%	0	79%	367	100%	0	58%
Twinhead Slimnote 875CX (Pentium/75)	367	599	236	55%	218	99%	436	99%	0	85%
HIGH-END VALUE										
AMS PowerCD 8500 (Pentium/120)	244	307	283	30%	⊗	98%	333	99%	0	83%
Austin Edge CD (Pentium/133)	418	614	268	32%	0	79%	321	99%	0	56%
BSI NP8662T (Pentium/120)	458	613	204	42%	3	97%	315	99%	0	59%
ChemBook 5400 TFT (Pentium/150)	418	612	273	41%	79	99%	405	100%	0	71%
Gateway Solo S5-120 (Pentium/120)	381	599	241	37%	5	99%	399	99%	0	75%
IBM ThinkPad 365XD Pentium/120	400	614	289	35%	0	83%	0	74%	0	58%
Keydata Keynote GT (Pentium/120)	405	614	278	20%	0	82%	58	99%	0	53%
Maximus MediaNote CD Book (Pentium/133)	443	611	205	37%	0	93%	23	99%	0	60%
MaxTech YesBook Model X753 (Pentium/120)	404	613	285	32%	14	99%	404	99%	0	67%
NEC Versa 4000C (Pentium/75)	358	614	294	41%	221	99%	120	99%	0	63%
Olivetti Echos P133S (Pentium/133)	412	614	268	33%	0	86%	264	99%	0	60%
Polywell Poly 500NB5 (Pentium/133)	421	612	253	20%	0	95%	389	99%	0	44%
TI Extensa 570CDT (Pentium/100)	386	600	232	35%	3	98%	340	99%	0	67%
Toshiba Satellite Pro 420CDT (Pentium/100)	583	913	180	46%	0	89%	71	99%	0	53%
Twinhead Slimnote 8100TX (Pentium/100)	384	600	231	45%	0	82%	239	100%	0	63%
Unisys Aquanta MN (Pentium/120)	389	612	267	50%	209	99%	395	99%	0	76%

(1) With an Action, Indeo, 320 x 240, 30-fps, 600-KBps clip.

(2) With an Action, Indeo, 160 x 120, 30-fps, 300-KBps clip scaled to full screen (1,024 x 768).

(3) With an Action, Cinepak, 320 x 240, 30-fps, 300-KBps clip.

⊗ This unit's performance was too poor to measure.

represents the disk subsystem's performance under Windows. The **CPUMark₁₆** and **CPUMark₃₂** scores gauge the speed of a PC's processor subsystem—which includes the CPU, secondary cache, and system RAM—under 16- and 32-bit operating systems, respectively.

The **ZD CD-ROM WinMark 96** tests gauge the performance of the notebooks' CD-ROM subsystem, which includes the CD-ROM drive and its required software drivers. This test suite is based on a profile of six of today's most popular Windows CD-ROMs.

We report the results of the **CD-ROM Sequential 16K Read** test, which measures the throughput of the CD-ROM subsystem as it reads 16K blocks of data on a CD-ROM. The **Access Time** score measures the CD-ROM drive's performance while randomly accessing 2K blocks from the entire CD-ROM.

The **CD-ROM CPU Utilization** score represents the percentage of the processor's bandwidth occupied by servicing the CD-ROM subsystem while it retrieves data. To determine the utilization, WinBench 96 uses a default block size of 16K. The transfer rate defaults to the maximum rate of your particular CD-ROM subsystem. WinBench 96 then calculates this transfer rate before it runs the actual test. WinBench 96

also includes the Video test, a suite of 33 video clips that measure the PC's ability to play full-motion AVI files. The Video test allows you to test video-playback performance with two types of clips at a variety of data and frame rates, using either the Indeo or Cinepak codec.

We report results from the **High-Quality Action Indeo** test, which uses an Action Indeo, 320-by-240, 30-frame-per-second, 600-KBps video clip; the **Full-Screen Scaling** test, which uses the Action Indeo, 160-by-120, 30-fps, 300-KBps clip; and the **Medium-Quality Action Cinepak** test, which uses an Action Cinepak 320-by-240, 30-fps, 300-KBps clip.

Our **ZD BatteryMark** test measures a notebook's battery life by exercising three different 32-bit software workload engines, one each for processor, disk, and graphics tasks. BatteryMark mixes these workloads together and adds periodic "think times," or breaks, in the work that reflect the way users pause while working. We use standard power-management settings during testing: 30 seconds for display timeout, 2 minutes for hard disk timeout (or the closest value available), and Auto or Fast CPU speed. BatteryMark also uses Microsoft Advanced Power Management where possible to automate procedures and provide information.

It even gets people to agree.

“One of the most thoughtfully designed personal digital assistants on the market.”

Windows Sources



Windows Sources

“A breakthrough product... by far the best little computer I have ever seen.”

Wall Street Journal

“If you're searching for the ultimate palm-size organizer, look no further.

★★★★★”

PC Computing

“The most important function for a PDA is to communicate back to the user's desktop. At last a device that takes this communications link seriously.”

Mobile Office



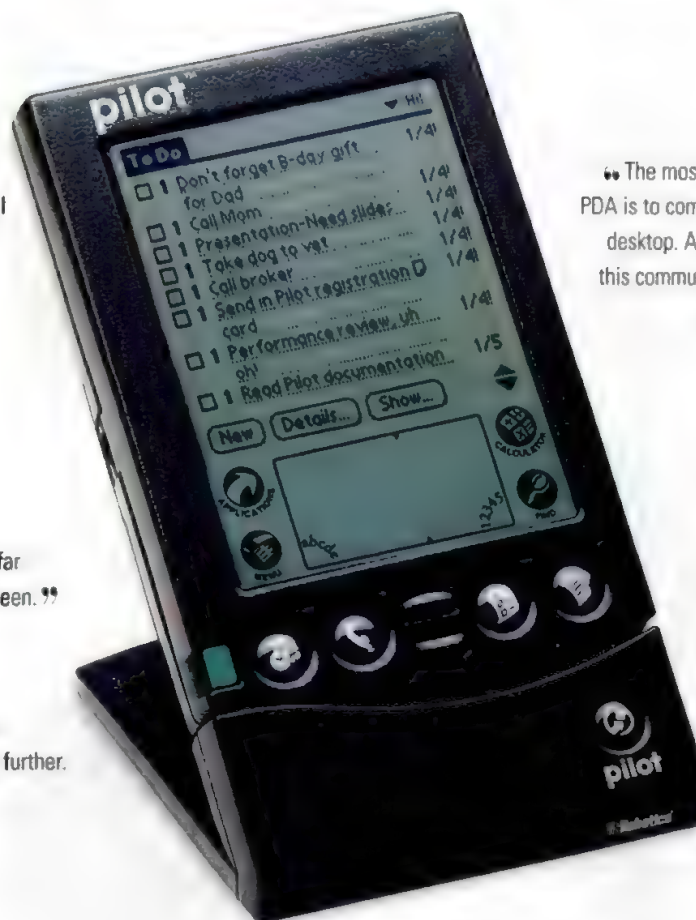
Byte Magazine

“The first hand-held I've wanted to buy.”

San Jose Mercury News

“A little dynamo.”

Business Week



But don't take their word for it. Try Pilot out for yourself and see what everyone's raving about. Pilot is the only truly connected organizer—complete with everything you need to stay in sync with your PC. At just over 4.5" and at \$299*, it's the

pilot

The one touch organizer

only pocket organizer that fits your shirt pocket and your pocketbook. And the only one versatile and powerful enough to get this kind of consensus. To find out where to get your hands on one, call 1-800-881-7256. To arrange a demo, visit our web site at <http://www.usr.com/palm>.

EGGHEAD

CIRCUIT CITY

COMPU\$A

COMPUTER

U.S. Robotics
The Intelligent Choice in Information Assets

*The average U.S. street price for Pilot, complete with all desktop and organizer software, docking cradle and accessories. © 1998 U.S. Robotics, Inc. U.S. Robotics and the U.S. Robotics logo are registered trademarks and Pilot is a trademark of U.S. Robotics, Inc. and its subsidiaries. All other product names are registered trademarks or trademarks of their respective owners.



The 1996 Travelers' Guide to Portable Computing



Traveling is no longer a perk reserved for a select few employees: It's part of daily business for many. In this

special foldout section, we offer tips, tricks, and useful phone numbers to help you on

the road, including online service and Web site information, support numbers for major notebook vendors, and information on travel providers and hotels. We hope that it makes your time away from the office more productive and hassle-free.

PERSONAL INFORMATION

Your voice mail system's remote dial-in phone number: _____

Your e-mail system's remote dial-in phone number: _____

Bps: _____ Parity: _____ Stop bits: _____

Your PC's dial-in line: _____

Bps: _____ Parity: _____ Stop bits: _____

Your travel agent's phone number: _____

Your notebook's serial number: _____



TRAVELERS' CHECKLIST

Some items are must-haves, others are merely options. Check

through the following list to make sure you don't leave essentials behind. Use a felt-tip or ballpoint pen to fill in key personal information, below left.

CRITICAL ITEMS:

- ☐ Notebook computer
- ☐ Notebook AC adapter and cables
- ☐ Modem and connector cable
- ☐ RJ-11 phone cord
- ☐ Electrical and phone adapters for international use
- ☐ Business cards
- ☐ Day planner and meeting schedule
- ☐ Cash, traveler's checks, local currency
- ☐ Tickets, itinerary, directions
- ☐ Passport, necessary visas, appropriate documentation

REMEMBER TO:

- ☐ Charge notebook batteries.
- ☐ Change your voice mail message.
- ☐ Set up your desktop PC for remote access.
- ☐ Transfer working files to your notebook.

OPTIONAL ITEMS:

- ☐ Spare notebook battery
- ☐ Blank floppy disks
- ☐ Bootable floppy disk
- ☐ Notebook manual, especially for new or little-known models (necessary at some airports where security weighs units)
- ☐ In-line RJ-11 coupler
- ☐ Acoustic or handset coupler (especially for international travel)
- ☐ RJ-11 Y splitter
- ☐ 12V DC-to-120V AC inverter
- ☐ Short printer cable
- ☐ Three-prong-to-two-prong AC adapter
- ☐ AC extension cord or power strip
- ☐ Cellular phone (and charger, spare battery, car adapter)
- ☐ Pager and spare battery
- ☐ Blank airbills for overnight delivery services
- ☐ Phone-line tester (checks line safety)
- ☐ Toolkit (needle-nose pliers, screwdriver, pocketknife, alligator clips, small flashlight)
- ☐ Velcro cable ties



SUPPORT INFORMATION FOR THE TOP 10 NOTEBOOK VENDORS

You're on the road and your notebook decides not to work with you, or you're unsure about a certain feature. For answers, the best place to go is the vendor that built it. Important support information for the top 10 notebook vendors is listed here.

Company	Customer information	Technical support	Tech-support fax	Tech-support hours (eastern time)	Web site	BBS	Automated fax-back
Apple Computer Inc.	800-766-2333	800-767-2775	None	9:00-9:00, M-F	www.apple.com	None	800-510-2834
AST Research Inc.	800-876-4278	800-727-1278	800-926-1278	24 hours, 7 days	www.ast.com	817-230-6850	800-926-1278
Compaq Computer Corp.	800-345-1518	800-652-6672	713-518-0562	24 hours, 7 days	www.compaq.com	713-518-1418	800-345-1518
Dell Computer Corp.	800-613-3355	800-247-9252	512-728-3589	24 hours, 7 days	www.us.dell.com	512-728-8528	800-950-1329
IBM Personal Computer Co.	800-426-2968	800-772-2227	None	24 hours, 7 days	www.ibm.com	919-517-0001	800-426-4329
NEC Technologies	800-632-8377	800-632-4525	None	8:00-8:00, M-F	www.nec.com	508-635-4706	800-366-0476
Texas Instruments Inc.	800-848-3927	800-848-3927	None	24 hours, 7 days	www.ti.com	817-774-6809	800-848-3927
Toshiba America	800-334-3445	800-999-4273	None	24 hours, 7 days	computers.toshiba.com	714-837-4408	800-999-4273
WinBook Corp.	800-468-7502	800-468-1225	800-448-0308	8:00 A.M.-9:00 P.M. M-F, 9:00-4:00 Sat.	www.winbookcorp.com	614-529-9133 (Ohio)*	None
Zenith Data Systems	800-227-3360	800-227-3360	847-808-4500	24 hours, 7 days	www.zds.com	847-808-2264	800-582-8194

* Local numbers are available for other states.



TRAVELERS' LITTLE BLACK BOOK

Forget to call ahead for a car or need to change a flight or hotel reservation? Credit card stolen? Here are numbers of major service providers in case the unexpected happens.

AUTOMOBILE RENTALS

Company	Information
Alamo	800-327-9633
Avis	800-331-1212
Budget	800-527-0700
Dollar	800-800-4000
Enterprise	800-325-8007
Hertz	800-654-3131
National	800-328-4567

LOST CREDIT CARDS

Company	Information
American Express	800-528-4800
Diners Club	800-234-6377
MasterCard	800-826-2181
Visa	800-336-8472

LODGINGS

Company	Information
Best Western	800-528-1234
Courtyard by Marriott	800-321-2211

LODGINGS (continued)

Company	Information
Doubletree	800-222-8733
Embassy Suites	800-362-2779
Fairmont	800-527-4727
Four Seasons	800-332-3442
Hilton	800-445-8667
Holiday Inn	800-465-4329
Hyatt	800-233-1234
Inter-Continental	800-327-0200
ITT Sheraton	800-325-3535
Marriott	800-228-9290
Meridien	800-543-4300
Omni	800-843-6664
Radisson	800-333-3333
Ramada	800-854-7854
Renaissance	800-468-3571
Resinnter Group†	800-221-4542
Ritz-Carlton	800-241-3333
Westin	800-228-3000

† Manages several chains, including Novotel and Sofitel.

OVERNIGHT DELIVERY SERVICES

Company	Information	Your account #
Airborne Express	800-247-2676, 800-229-4685**	
DHL	800-225-5345	
Federal Express	800-238-5355	
UPS	800-742-5877, 800-782-7892**	

** For international destinations.

TRAVEL

Carrier	Domestic information	International information
Air France	-	800-237-2747
Alitalia	-	800-223-5730
American	800-433-7300	800-624-6262
Amtrak	800-872-7245	-
ANA	-	800-235-9262
British Airways	-	800-247-9297
Continental	800-525-0280	800-231-0856
Delta	800-221-1212	800-241-4141
JAL	-	800-525-3663
Lufthansa	-	800-645-3880
Mexicana	-	800-531-7921
Northwest	800-225-2525	800-447-4747
Qantas	-	800-227-4500
SAS	-	800-221-2350
Singapore	-	800-742-3333
Swissair	-	800-221-4750
TWA	800-221-2000	800-892-4141
United	800-241-6522	800-241-6522
USAir	800-428-4322	800-622-1015
Virgin Atlantic	-	800-862-8621

	AC power	RJ-11 phone jack	America Online local access	CompuServe local access
Italy	220V, special plug	No	Milan, 02-86-90561	Milan, 02-224-79532
Japan	110V, U.S. or special plug	Yes	Tokyo, 03-3346-9261	Tokyo, 03-5471-7650
South Korea	110V, 220V, U.S. or special plug	Yes††	Seoul, 02-775-6647	Seoul, 02-565-2323
Switzerland	220V, special plug	No	Geneva, 022-788-6166	Geneva, 022-738-9740
Taiwan	110V, U.S. or special plug	Yes	Taipei, 2-651-6119	Taipei, 2-356-0786
United Kingdom	240V, special plug	No	London, 0181-899-5096	London, 0171-570-5000

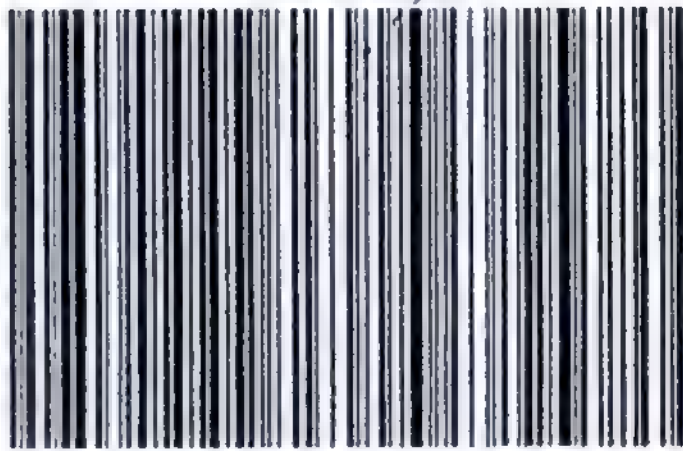
Note: Online access in some cities may require an additional fee. Local numbers may also be available in other cities.

†† Not universally available.

1. Follow instructions on the other side

Back

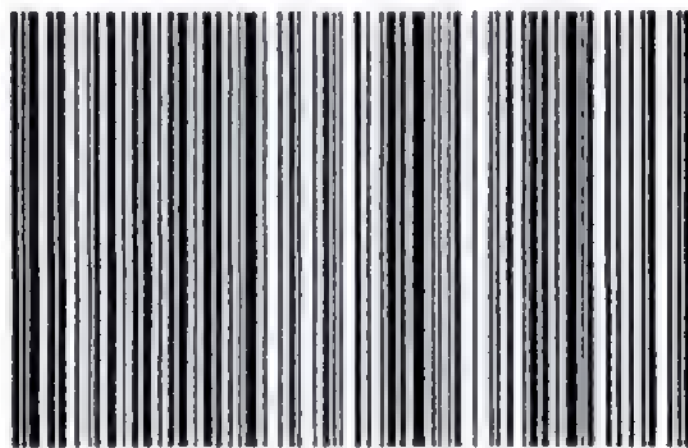
Gbs5lipBack-0018



Inverted Back

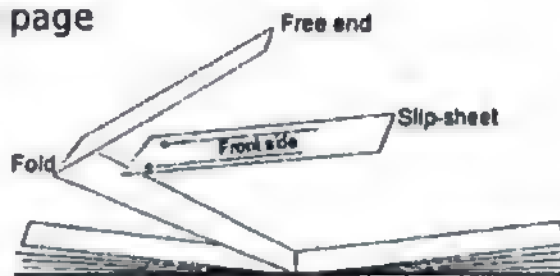
1. Follow instructions on the other side

Folded edge of the page



Inverted Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Foldout slip-sheet

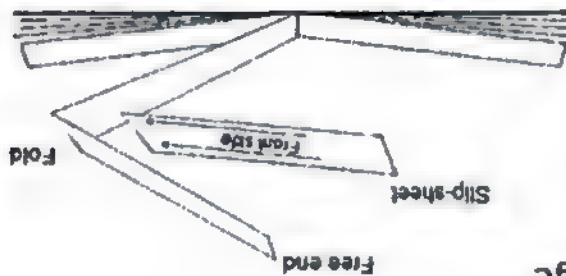
1. Open the foldout page
2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

3. Slice the folded edge

4. Close the page and slip-sheet





ONLINE SERVICES

	Type of service	Customer service (U.S. and Canada)	U.S. number for international service	Support hours (eastern time)	Domestic local-access numbers	International local-access numbers	Cost of service
America Online Inc.	Full-service provider	Customer service: 800-827-6364, tech support: 800-827-3338	703-264-1184	6:00 A.M.-4:00 A.M., 7 days	Use the keyword <i>access</i> on AOL for an online directory. Toll-free access: 800-716-0023 (\$0.10-per-minute surcharge).	Use the keyword <i>globalnet</i> on AOL for an online directory.	\$9.95 per month for 5 hours, \$2.95 each additional hour or \$19.95 per month for 20 hours, \$2.95 each additional hour
CompuServe Information Service	Full-service provider	800-848-8990	614-529-1340	8:00 A.M.-midnight M-F; 10:00 A.M.-10:00 P.M. Sat., Sun.	Call 800-635-6225 for a directory or type <i>GOPHONES</i> on CompuServe.	Call 800-635-6225 for a directory of the U.S. and Canada. Call 800-848-8990 for a directory of other countries.	\$9.95 per month for 5 hours, \$2.95 each additional hour or \$24.95 per month for 20 hours, \$1.95 each additional hour
MCI Mail	E-mail provider	800-444-6245	202-833-8484	24 hours, 7 days	800-456-6245	Call 800-444-6245 for the local-access number. (Local numbers have a \$0.50-per-minute surcharge.)	\$35 per year plus \$10 per month per account
The Microsoft Network (MSN)	Full-service provider	800-386-5550 (U.S.), 800-952-1110 (Canada)	MSN Help lists a separate number for support in each country's language.	7:00 A.M.-2:00 A.M. M-F; noon-10:00 P.M. Sat., Sun.	A directory is available under Phonebook on MSN.	A directory is available under Phonebook on MSN.	\$4.95 per month for 3 hours, \$2.50 each additional hour
Prodigy Services Co.	Full-service provider	800-776-3449	N/A	24 hours, 7 days	800-776-3449	N/A	\$9.95 per month for 5 hours, \$2.95 each additional hour or \$30 for 30 hours, \$2.95 each additional hour
SpryNet	Internet service provider (subsidiary of CompuServe)	Customer service: 206-957-8997; tech support: 206-957-8998	N/A	3:00 A.M.-6:00 P.M. M-F	Call 800-635-6225 for a directory.	N/A	\$19.95 for unlimited hours or \$9.95 for 7 hours or \$4.95 for 3 hours, \$1.95 each additional hour

N/A—Not applicable The service is available only in the U.S. and Canada



AOL AND COMPUSERVE ACCESS

Getting access numbers before you leave is a good idea, but in case you forget, here are some numbers for major U.S. cities (access at 28.8 Kbps). If your destination isn't listed here, see the table above, where we list directions for obtaining other access numbers and customer service numbers

	AOL phone number	CompuServe phone number		AOL phone number	CompuServe phone number		AOL phone number	CompuServe phone number
Atlanta, GA	404-865-9846	404-841-0578	Houston, TX	713-224-9700	713-650-5143	Philadelphia, PA	215-209-8400	215-561-1634
Austin, TX	512-464-0013	512-326-1155	Indianapolis, IN	317-977-1000	317-638-8129	Phoenix, AZ	602-241-7800	602-468-0285
Baltimore, MD	410-246-0100	410-494-8403	Kansas City, MO	816-254-3970	816-221-3817	San Diego, CA	619-239-2960	619-467-9508
Boston, MA	617-357-8800	617-426-9295	Los Angeles, CA	213-938-0182	213-624-3730	San Francisco, CA	415-357-9919	415-296-9513
Chicago, IL	312-228-8000	312-693-4100	Memphis, TN	901-452-7000	901-454-6851	San Jose, CA	408-297-0522	
Dallas, TX	214-658-9600	214-720-9183	Minneapolis, MN	612-332-3172	612-339-1805	Seattle, WA	206-470-8300	206-515-6000
Denver, CO	303-360-0300	303-595-0123	Nashville, TN	615-254-5100	615-367-0014	St. Louis, MO	314-621-0307	314-421-5651
Detroit, MI	313-964-2523	313-535-1466	New York, NY	212-365-2000	212-766-2080, 212-593-3972	Washington, DC	202-728-9000	202-547-0103
Honolulu, HI	808-537-5300	808-528-0430						



TEN COMMON INTERNATIONAL DESTINATIONS

To help you stay connected while traveling abroad, keep the information below at hand

	AC power	RJ-11 phone jack	America Online local access	CompuServe local access
Canada	120V, U.S. plug	Yes	Toronto, 416-364-3400	Toronto, 416-367-8122
France	220V, special plug	No	Paris, 1-47-47-15-64	Paris, 1-47-08-07-08
Germany	220V, special plug	No	Berlin, 030-633-8531	Frankfurt, 069-20976
Hong Kong	220V, special plug	Yes††	2519-9040	3002-8332



TIPS FOR CONNECTING ON THE ROAD

Trying to transfer data while away from the office can be a severe test of patience. Below are some tips to make things a little easier. We also include advice on notebook security.

Disable call waiting to avoid inadvertent disconnection while you're downloading: Dial *70 from most Touch-tone phones (1170 from rotary phones). If that fails, try #70, 70#, or 70*.

Making a cellular connection? A modem that supports a cellular error-correcting protocol, such as TxCel or MNP10, and a cellular phone that's data-ready (marked MC² on Motorola phones) are musts. Most modems will auto-detect, so you don't need to initialize them. To route properly for most carriers, dial *3282 (*DATA) to connect to your provider's modem bank. When you're done, "AT&F" should restore your modem's default configuration.

Need to print? Keep common printer drivers (such as those for the HP LaserJet and DeskJet, the Epson dot-matrix printers, and a generic text printer) on your notebook so you can connect to whatever's available in your hotel's business center, branch

office, or nearby copy shop. In a pinch, you can use fax software to "print" to a hotel or shop's fax machine. This is expensive, but it works.

Transfer data while aloft using GTE's Airfone or AT&T's AirOne. Don't try to send large files, and don't expect to connect to anything faster than 2,400 bps. Domestically, Airfone now costs a flat \$15 per call whether you're transmitting data, sending a fax, or making a voice call (international prices vary). AirOne costs \$2.50 for setup and \$2.99 per minute (domestically).

Transfer data from airports and many hotels using AT&T's Public Phone 2000. The RJ-11 jacks do work—but you need to follow the directions to the letter. You'll also need a calling card or major credit card, but there's no surcharge for data transmission.

Carry an in-line handset coupler that lets you connect your modem to the handset jack on any

phone (even digital ones). You'll avoid frying your PC Card modem on a digital PBX, and you'll be able to plug in even if you can't get to the RJ-11 jack or when you're in a country with incompatible plugs.

Reach the long-distance carrier of your choice by dialing one of these prefixes before the ten-digit area code and phone number (in the U.S.).

AT&T: 102880 (or 800-CALL-ATT)

MCI: 102220 Sprint: 103330

Laptop security:

- Brand your laptop (using silk screening) with your name or your company's name to make it more identifiable and less attractive to thieves.
- Ensure data safety with at least one level of password protection.
- Circumvent thieves at airport security checkpoints by handing your laptop to an attendant instead of putting it through the X-ray machine.
- Tape business cards to the bottom of your laptop and to the AC adapter.
- Use a Kensington MicroSaver lock when you're stationary.



SHOPPING FOR TRAVEL GEAR

Here are some companies that specialize in the essential accessories every frequent traveler should have. Useful items include acoustic couplers and power and modem adapters.

Konexx Unlimited Systems Inc.: International business and travel equipment, including acoustic couplers (which attach to telephone handsets so you can use a modem even if the telephone lacks an RJ-11 jack—especially useful overseas because not all countries have RJ-11 jacks). 800-275-6354,

619-622-1400; fax, 619-550-7330; www.konexx.com.

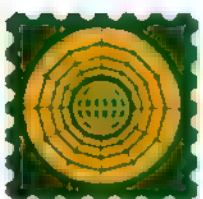
Magellan's Catalog: International power and telephone/modem adapters. 800-962-4943; fax, 805-568-5406; www.travelocity.com.

Mobile Planet Inc.: International power and

telephone/modem adapters. 800-675-2638, 818-888-9348; fax, 818-888-3484; www.mplanet.com.

Road Warrior Outpost: Modems, notebook accessories such as hard disks, memory chips, spare batteries, and GPS (Global Positioning Systems) equipment, which includes hand-held devices and GPS PC Cards. 800-274-4277 ext. 730, 714-418-1400; fax, 714-839-6282; www.warrior.com.

TeleAdapt Inc.: International power and telephone/modem adapters. 408-370-5105; fax, 408-370-5110; www.teleadapt.com.



TOP WEB SITES FOR THE BUSINESS TRAVELER

The World Wide Web provides something for everyone, and business travelers are no exception. Below are some sites that can give you the travel, news, and weather information that will make your time away from home go more smoothly. Remember to prefix each Web address with <http://>.

GENERAL-INTEREST SITES, NEWS, AND WEATHER

www.intellicast.com Intellicast. Weather site linked to NBC for U.S. and foreign weather.

www.nytimes.com The New York Times. Requires free registration.

www.pathfinder.com All-purpose activity site; includes info on news, weather, and travel. Requires free registration.

www.pcmag.com PC Magazine. Stories on home and office technology, print-magazine articles, and results of PC Magazine Labs' benchmark tests.

www.pointcast.com News and weather.

www.usa.ft.com London's Financial Times. Requires free registration.

www.usatoday.com USA Today. Multimedia news; easy-to-read weather pages.

www.weather.com The Weather Channel.

www.wsj.com The Wall Street Journal. Requires registration (\$49 a year for nonprint subscribers).

www.zdnet.com ZD Net. Access to the Web sites of all Ziff-Davis magazines.

HOTEL RESERVATIONS

All the sites below allow you to make reservations online.

www.hotelchoice.com Reservations for Choice hotels (Clarion, Comfort Inn, EconoLodge, Friendship, Quality Inn, Rodeway, and Sleep).

www.hotel.discount.com Lists U.S. hotels that offer specially discounted rates.

www.travelweb.com Umbrella site for many major hotel chains.

AIRLINES

www.amrcorp.com/aa_home/aa_home.htm American Airlines site. The only site that lets you check the status of a flight currently in the air.

www.british-airways.com British Airways site.

www.delta-air.com Delta Airlines site.

www.flycontinental.com Continental Airlines site. Includes a page of in-flight tips.

www.twa.com TWA site.

www.ual.com United Airlines site.

www.usair.com USAir site.

GENERAL TRAVEL SITES

These sites provide services and information specifically targeted at travelers.

metro.jussieu.fr/10001/bin/cities/english Guide to subway systems in cities across the world.

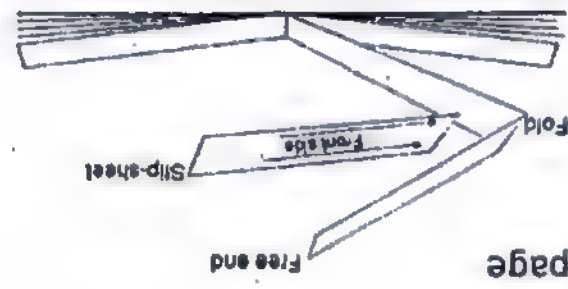
www.city.net Extensive descriptions of more than 2,000 cities across the world, including tourist attractions and hotel and restaurant listings.

www.krollassociates.com/kts Kroll Travel Watch site. Listing of attractions and warnings about cities all over the world, including the latest news. Requires a corporate subscription or \$6.95 per advisory.

www.mapquest.com MapQuest. Has a database of U.S. maps, restaurants, and tourist sites. Requires free registration.

www.rubicon.com/passport.html Rubicon Digital Passport. Site for international travelers, listing up-to-the-day currency exchange rates, international holidays, time zones, embassies, airline info, international delivery services, and international airport guides.

www.travelocity.com Travelocity. Lists attractions, restaurants, and hotels around the world.



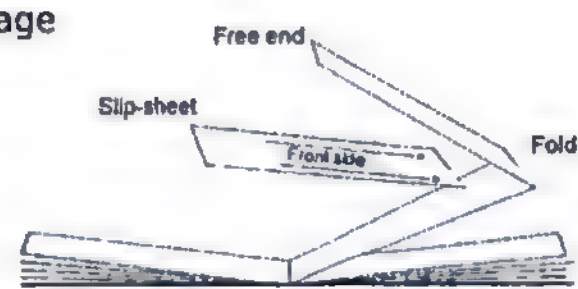
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2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

Inverted Foldout slip-sheet



Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back

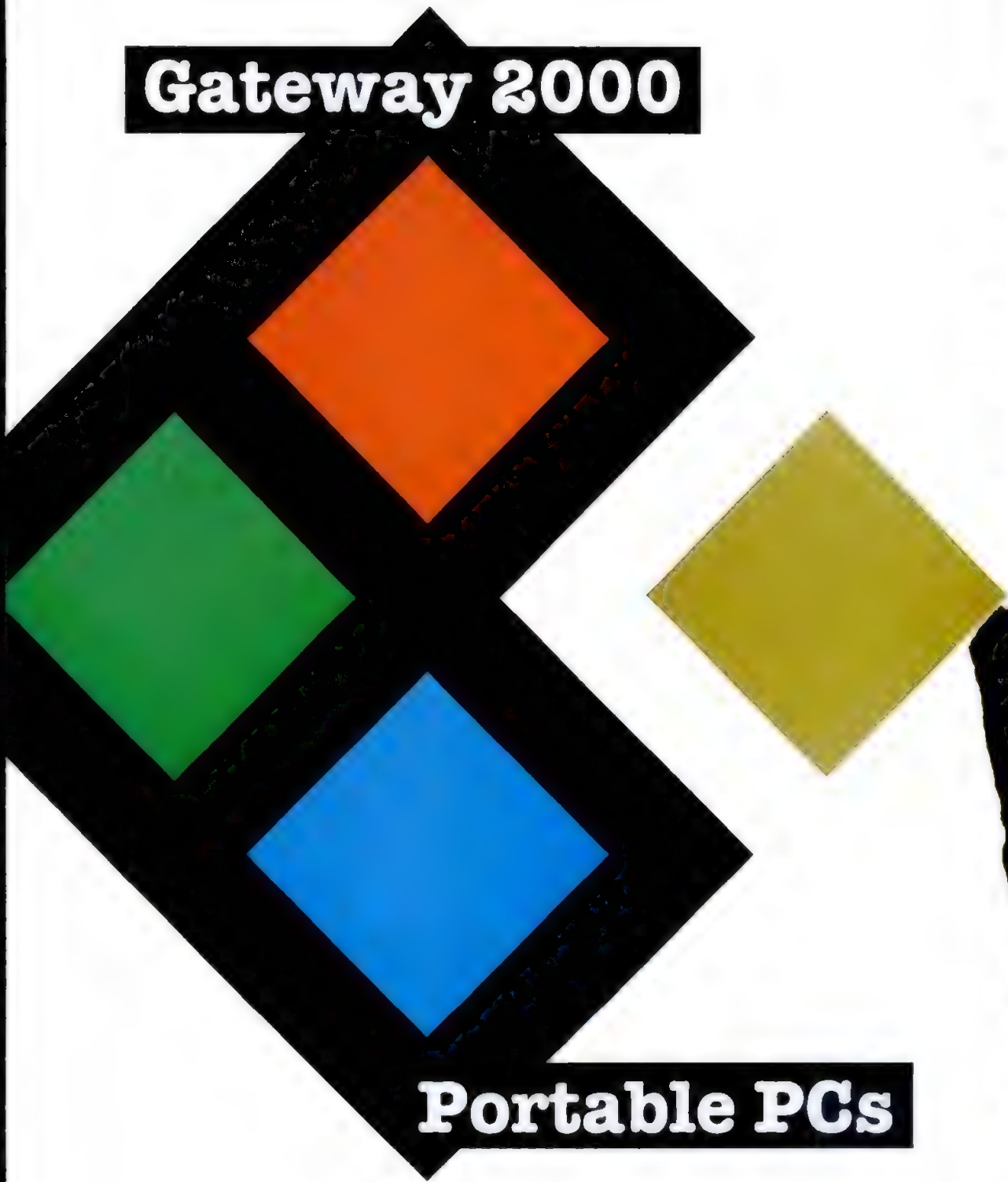


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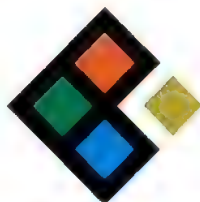
Back

1. Follow instructions on the other side

Gateway 2000



Portable PCs



GATEWAY2000
S O L O

◆ Definition of today's office: Wherever your work takes you. Introducing the Gateway Solo™ 2100 notebook, the newest addition to our portable PC line. Affordable and powerful, these multimedia systems are the ideal way to empower you or your whole company. All models feature an Intel Pentium® processor, minimum 11.3-inch SVGA color display, 16MB EDO RAM and a modular 6X CD-ROM drive. (After all, it's not really a PC without CD!) ◆ Any special computing needs? No problem. Each system can be custom configured. It's truly the only system you need. And technical support is just a phone call away — 24 hours a day, seven days a week. ◆ Because we understand your time is valuable, Gateway 2000 makes computer buying easy. Just pick up the phone and give us a call. It's that simple. A built-to-order Gateway Solo 2100 portable PC will be delivered right to your door. If you're not completely satisfied, no problem. You can return your system within 30 days of the original delivery date for a refund of the purchase price (shipping charges to and from the customer are not refundable). The Gateway Solo 2100 series — for *wherever* your office is. Call Gateway 2000 and order yours today!



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8 0 0 - 8 4 6 - 6 9 4 7

down, giving the unit below-average scores on both sets of Winstone tests, both sets of CPUmark tests, and the Graphics and Disk WinMark 96 tests. The CD-ROM WinMark 96 test score was average, thanks to a TEAC 4X CD-ROM drive.

The 5400 Dual includes a 773MB hard disk, a Cirrus Logic graphics chip set with 2MB VRAM, and an 11.4-inch SVGA dual-scan display. The nickel hydride battery sustained the unit for only 1:05 on our BatteryMark test.

The ChemBook 5400 TFT has a 150-MHz Pentium CPU and a 12.1-inch SVGA active-matrix screen. The 1.3GB hard disk and DRAM don't do much for the 5400 TFT's performance scores, which were more in line with those of a 100-MHz system. Because the CPUmark₁₆ and CPUmark₃₂ test scores were below average, they held down the Winstone 32 and Winstone 96 numbers to below-average levels. The notebook had below-average Graphics WinMark 96 and average Disk and CD-ROM WinMark 96 scores. The nickel hydride battery lasted 46 minutes on our BatteryMark test, the shortest time of any system in this roundup.

Chem USA includes a one-year parts-and-labor warranty with no on-site service but with live toll-free technical support on weekdays.—*BB*

ChemBook 5400 Dual. Street price: \$3,075.

ChemBook 5400 TFT. Street price: \$4,000. Chem USA Corp., Hayward, CA; 800-866-2436, 510-785-8080; fax, 510-785-1010. *Circle 506 on reader service card.*

Compaq Computer Corp.

Compaq LTE 5300

If you're looking for a top-quality multimedia presentation portable, the Compaq LTE 5300, from Compaq Computer Corp., is a stalwart choice. The Pentium/133-based LTE 5300, with a 12.1-inch active-matrix SVGA display, a Toshiba 1.3GB hard disk, and a 4X TEAC CD-ROM drive, is not inexpensive at a street price of \$6,647. But solid performance and a three-year warranty make this unit a good bet for corporate buyers.

Compaq's notebook has a travel weight of 8.3 pounds. Its modular design lets you inter-

change the CD-ROM drive with a floppy disk drive, an additional hard disk (for a potential on-board total capacity of 2.7GB), or a second battery. Without the CD-ROM drive, the base system is \$5,999. The LTE 5300's \$499 Multi-Bay Expansion Base docking station has room for two drive bays, each of which can accept a 3.5-inch floppy disk drive, a hard disk, or a CD-ROM drive; it also has a monitor stand and a full complement of



SUITABILITY TO TASK

	Desktop replacement	Road warrior
Compaq LTE 5300	Good	Good
Dell Latitude XPi P133ST	Fair	Good
Dell Latitude XPi P100SD	Fair	Good

peripheral ports.

Compaq uses its own motherboard with 256K pipelined-burst cache and conventional DRAM system memory in the LTE 5300, which holds its own in the presentation field. All its benchmark test scores were within the average range. The video subsystem has only 1MB memory, but its speedy EDO DRAM helps to keep its graphics performance average. Even the LTE 5300's battery life was very good—though not tops—scoring 2:32 on the BatteryMark test with a nickel hydride battery.

Compaq, a leader in service and support, sells the LTE 5300 with a three-year parts-and-labor warranty backed by 24-hour, 7-day toll-free technical support. No on-site service is available.—*BB*

Compaq LTE 5300. Street price: \$6,647. Compaq Computer Corp., Houston, TX; 800-345-1518; fax, 713-518-1442; <http://www.compaq.com>. *Circle 507 on reader service card.*

SERVICE & RELIABILITY	
Compaq Computer Corp.	
Reliability	Better than average
Repair	Better than average
Technical support	Better than average
Percent needing repair	Better than average

Dell Computer Corp.

Latitude XPi P100SD, Latitude XPi P133ST

If you are looking for a solid road-warrior notebook, the Latitude series from Dell Computer Corp. represent excellent choices. The Pentium/133-based high-end value Latitude XPi P133ST is priced at \$4,859 (direct), and the Pentium/100-based low-end value Latitude

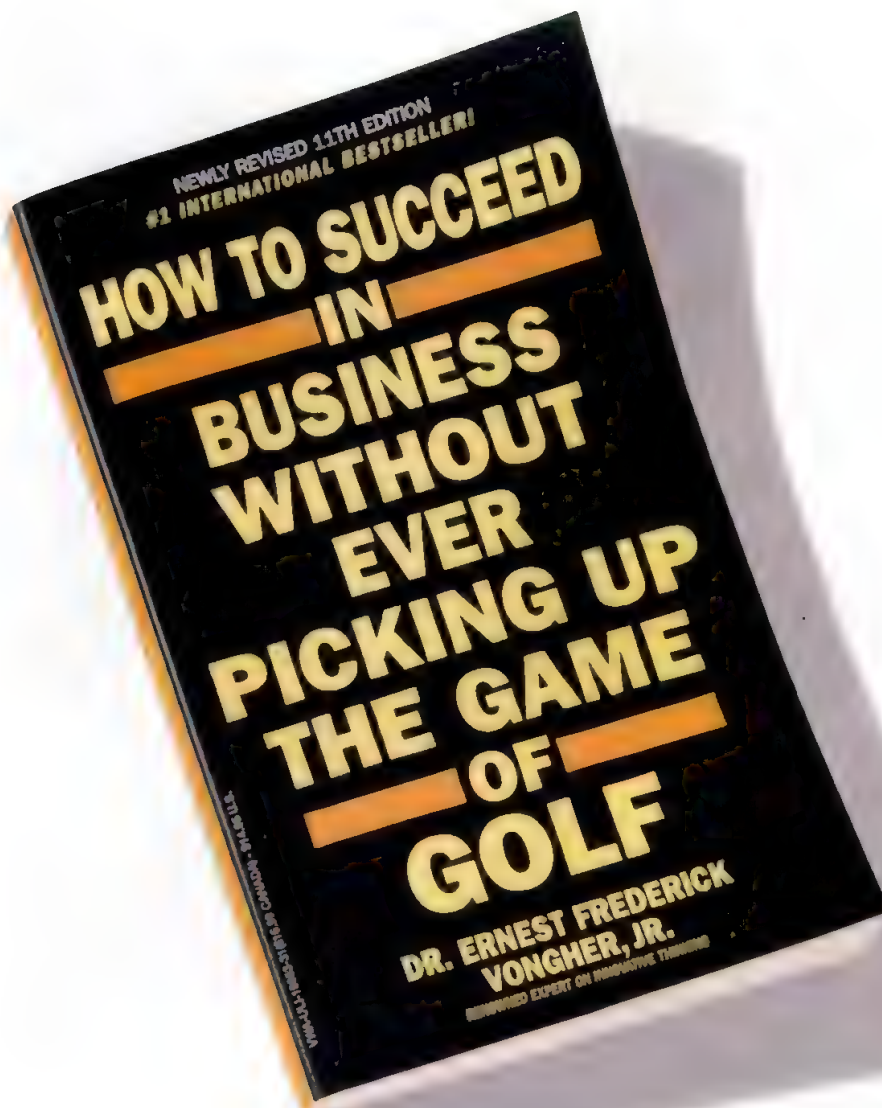
XPi P100SD, an honorable mention in this roundup, is \$3,459 (also direct).

The Latitude XPi P100SD left the competition in the dust on the BatteryMark test, lasting 4:52, thanks to the lithium ion battery and some clever engineering. The Latitude XPi P133ST lasted a competitive 3:09. Both Latitudes posted above-average results on our other tests, with the exception of average scores for the

P100SD on the CPUmark tests.

Each system comes equipped with an embedded trackball, two Type II PC Card slots, 16-bit audio, and an infrared port. The XPi P133ST has an 11.3-inch SVGA active-matrix display and a 1.2GB hard disk; the XPi P100SD has a 10.3-inch SVGA dual-scan display and 773MB of storage. For an additional \$229, you can buy an optional DeskDock with Advanced Port Replicator, which adds SCSI-2 and 10Base-T Ethernet to the system. At a travel weight of 6.9 pounds, the Latitudes are lighter than most notebooks in this roundup.

The most impressive feature of these notebooks is their power management. According to Dell, a combination of low-power components is responsible for a 20 to 30 percent reduction in power consumption. These components include mobile Pentium CPUs with Voltage Reduction Technology, power-saving graphics chip technology, and in the case of the XPi P133ST, an efficient active-matrix



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NEC

The Shape of Notebooks to Come

By Anush Yegyzarian

The current crop of notebooks is impressive, but some of their equally innovative brethren could not make our review deadline. To bridge that gap, here are specs on some of the newly available or soon-to-be available notebooks from Compaq, Fujitsu, Hitachi, NEC, Sharp, and Toshiba. In the First Looks section of this issue, you will find reviews of four new lightweights: Compaq's Armada 4100 series, Fujitsu's Montego, Hitachi's C120, and Toshiba's Portégé 650CT.

NEW FACES

The strong growth projected for the portables market has lured in two new vendors: Fujitsu and Hitachi. The Milan, Monte Carlo, and Montego notebook series mark Fujitsu's entry, while Hitachi makes its bow with its M series and its C series of lightweights.

Notebooks in the three Fujitsu lines all offer infrared ports, 16-bit sound, and lithium ion batteries. The mainstream workhorse is the Milan, offering an 11.3-inch active-matrix display and a weight of just under 6 pounds. The units, priced from \$2,199 to \$3,999, also feature bridge-battery technology that allows warm-swapping of batteries.

Notebooks in the Fujitsu Monte Carlo series are multimedia desktop replacements and come with 11.3- or 12.1-inch SVGA TFT displays, a 6X CD-ROM drive, MPEG1 support, and

a removable floppy disk drive that can be replaced with a second battery. These systems weigh about 7.3 pounds and are priced from \$3,299 to \$4,999. Both lines offer 100- to 133-MHz CPUs and 810MB or 1.2GB hard disks.

Hitachi's M series targets users looking for full-featured multimedia-ready notebooks. The systems come with a 4X CD-ROM drive (6X on 133-MHz models), an integrated 28.8-Kbps modem, 10Base-T Ethernet and IR ports, and 16-bit sound with two speakers—not bad for a 7-pound package. The 11.8-inch SVGA TFT screen is ultra-flexible: You can slide it back or bring it forward at its base to improve viewing angles. The units have 1GB of storage, 16MB of RAM, nickel hydride batteries and go up to a 133-MHz CPU. Prices range from \$2,499 to \$5,499.

FAMILIAR PLAYERS

Compaq is represented in our roundup by its LTE 5300, a full-featured unit. But aside from that and its lightweight Armada 4100, it also markets the value-oriented Armada 1120 series, which replaces Compaq's Contura 400 line. Standard components include a 10.4-inch VGA display (dual-scan or active-matrix), an 810MB hard disk, and a nickel hydride battery. Units weigh about 6 pounds, and pricing starts at \$1,899.

NEC's Versa 4000 series was covered in our main review, but the new Versa 6000s missed our deadline. The new multimedia units come with 133- or 100-MHz CPUs, 256K L2 cache, 16MB RAM standard, 11.3- or 12.1-inch active-matrix SVGA displays, a 6X CD-ROM drive, an internal cellular-ready 28.8-Kbps voice modem, 1GB+ hard disks, a lithium ion battery, 64-bit graphics, front and back 4-Mbps Fast IR ports, and 32-bit PC CardBus support.

The Versa 6000 also boasts integrated MPEG hardware. Its VersaBay II modular slot can fit a floppy disk drive, CD-ROM drive, second battery, or a second hard disk. These systems weigh

about 7 pounds. One model, the 6030X, will have a 12.1-inch display capable of 1,024-by-768 resolution (XVGA). Prices range from about \$5,399 to \$6,499.

Sharp's new system is the 7-pound PC-9080. This multimedia notebook includes a Pentium/133, 256K of L2

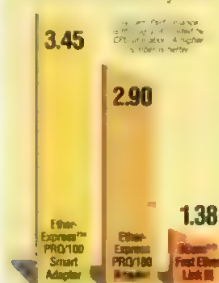


cache, a 1.3GB hard disk, 4-Mbps Fast IR, a removable 6X CD-ROM drive, and 16-bit stereo sound. Its most obvious feature is its brilliant 12.1-inch XVGA screen, which uses Sharp's new Super High Aperture technology to reduce power consumption and increase screen brightness. The unit also has 64-bit PCI architecture and a removable floppy disk drive that can be replaced by a second lithium ion battery. Units are expected to cost under \$6,000.

Toshiba's newest Portégé, the Pentium/133-based 650CT, was also not available in time to meet our deadline. This lightweight notebook has all the features of most mainstream portables but ups the ante with ZPV MPEG technology and 32-bit CardBus support, plus a 11.3-inch SVGA TFT display, 1.2GB hard disk, 64-bit graphics, and full duplex 16-bit sound, all in a sub-5-pound package. (The floppy disk drive is external.) The unit also has 2MB of VRAM for its graphics subsystem, and an integrated 28.8-Kbps modem. Units with 16MB of EDO DRAM and 256K of pipelined-burst cache are \$4,999.



Performance/Efficiency Index*



*SOURCE: LANQuest Labs, September 1999



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display. An improved power management algorithm reduces the power load and allows user configuration through a utility in Windows 95. Other impressive components include a 128-bit graphics accelerator with a 64-bit BitBLT engine from NeoMagic and 256K of synchronous L2 cache.

SERVICE & RELIABILITY

Dell Computer Corp.

Reliability	Better than average
Repair	Average
Technical support	Average
Percent needing repair	Average

Both Latitudes are protected by a three-years-parts, one-year-labor warranty.—CL

Latitude XPi P100SD. Direct price: \$3,459.
Latitude XPi P133ST. Direct price: \$4,859.
Dell Computer Corp., Austin, TX; 800-613-3355, 512-338-4400; fax, 800-727-8320; <http://www.dell.com>. Circle 508 on reader service card.

Diamond Flower Instrument

DFI 7200TC

With a laudable array of modular multimedia features and average performance, Diamond Flower Instrument's \$4,199 Pentium/133-based DFI 7200TC fulfills the needs of its target market—users who need a versatile mobile presentation solution. DFI, originally a graphics card manufacturer, now sells DFI-brand desktops and notebooks and provides components to other PC vendors.

The unit has a travel weight of 8.1 pounds and features a 10.4-inch active-matrix SVGA display. Graphics are handled by a 32-bit Cirrus Logic CL-GD7543 chip set and 1MB of DRAM. The unit offers an integrated 16-bit FM synthesis audio system, a game/MIDI port, an NTSC- and PAL-compatible video-out port, a docking station port, and an IrDA-compliant infrared transceiver.

The 7200TC was an average performer across all our tests within its category. The lithium ion battery was one of the lightest we encountered (about 12 ounces), but it lasted just 1:24 on our BatteryMark test.

The 7200TC's front-mounted 4X CD-ROM drive module can be swapped for a floppy disk drive module or for a second battery. The floppy disk drive can be used externally via a special cable.

The 7200TC's case design is similar to that of four other units in this roundup:



DFI, Digital CTS5120 (with docking station).

SUITABILITY TO TASK

	Desktop replacement	Road warrior
DFI 7200TC	Good	Good
Digital HiNote Ultra II CTS5120	Fair	Good
Digital HiNote CP CSS5100	Fair	Fair
Digital HiNote VP CTS5100	Fair	Fair

Twinhead's Slimnote 875CX, 8100TX, and 8120TV and ARM's ARMNote TS80CD133TX.

DFI offers a one-year-parts, three-year-labor warranty.—RSA

DFI 7200TC. Street price: \$4,199. Diamond Flower Instrument, Fremont, CA; 800-334-1196, 510-657-5678; fax, 510-657-5685. Circle 509 on reader service card.

Digital Equipment Corp.

HiNote VP CSS5100, HiNote VP CTS5100, HiNote Ultra II CTS5120

Digital Equipment Corp.'s three entries span the lightweight and both value classes. The HiNote Ultra II CTS5120 (\$4,799 street) is the thinnest and lightest notebook here at only 4.7 pounds (travel weight). The 120-MHz unit was an average performer, with a strong Disk WinMark 96 score and an excellent BatteryMark score of 3:02. The 100-MHz high-end value HiNote VP CTS5100 and the 100-MHz low-end value HiNote VP CSS5100 have 6.7-pound travel weights and cost \$2,999 and \$2,499, respectively.

Designed for power users looking for the ultimate in portability, the Ultra II features an external floppy disk drive that snaps to the bottom of the system (a

version of this drive with additional PC Card slots is \$299) and a lithium ion battery that attaches to the rear of the notebook and folds down to angle the unit for easier typing. An optional Mobile Media Module (\$699) adds a 4X CD-ROM drive (6X will be standard when you read this), better stereo speakers, and 1.9 pounds. The unit also offers a 10.4-inch active-matrix SVGA display, two Type II PC Card slots, and a trackball.

Geared for business users on a budget, the CTS5100 and the CSS5100 share many features, including a touch pad, built-in 16-bit audio with speakers, two Type II PC Card slots, and an infrared port. The removable floppy disk drive can be replaced with a second battery, an AC adapter, or a \$99 car adapter. Both displays are 10.4 inches, but the CTS5100 has an active-matrix screen, and the CSS5100 uses a dual-scan panel.

The CTS5100 and CSS5100 were unable to produce consistent scores on our tests. The test scores that we report are the highest scores produced during multiple test runs; all fall into the average range for each unit's category. We believe these variances—ranging from 17 to 350 percent, depending on the test—are caused by Digital's Active Thermal Feedback feature, which clocks back the CPU when excessive system heat is detected (see "What the Numbers Mean" for more details).

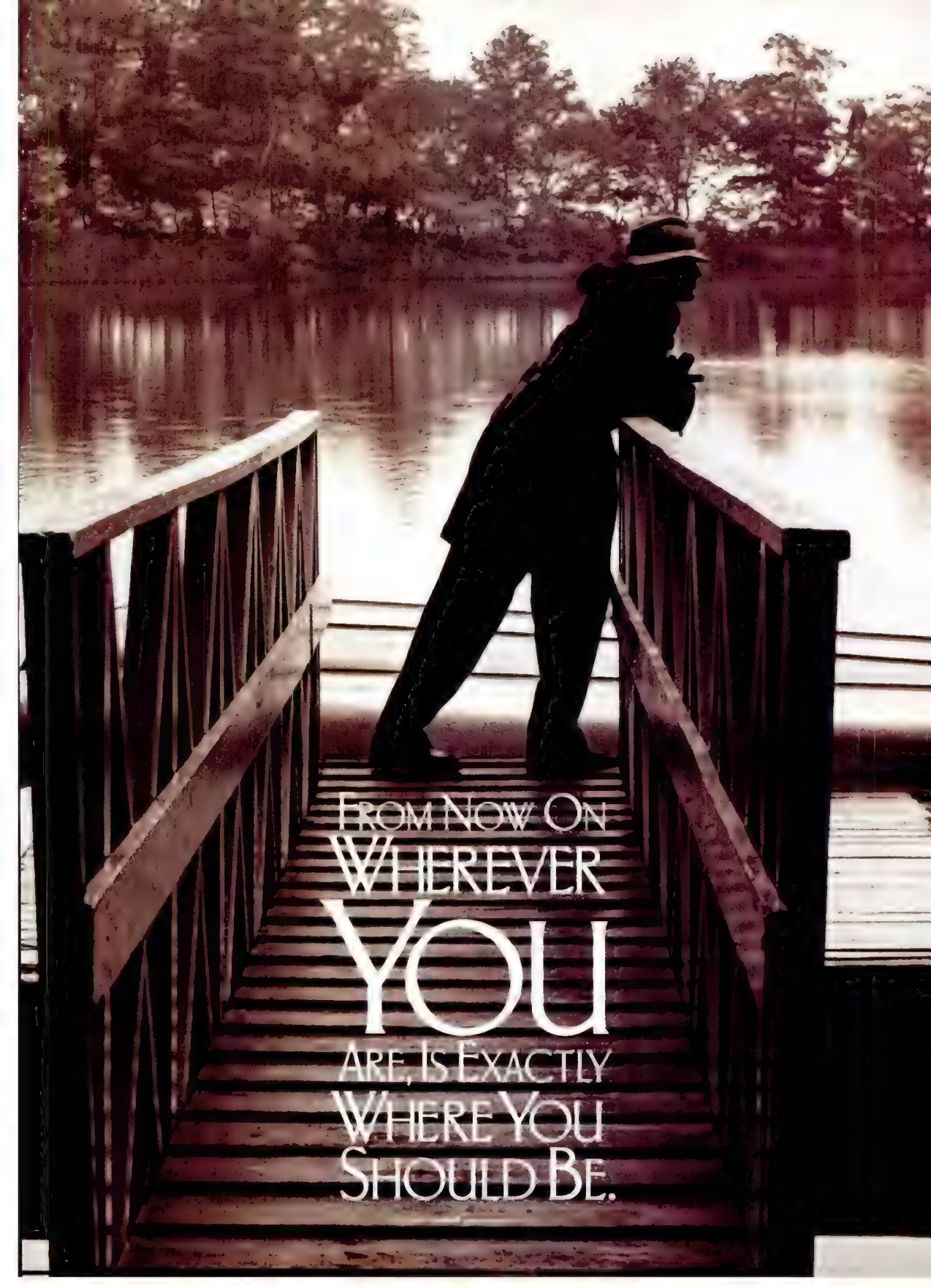
The HiNote VPs come with one-year warranties; the Ultra II CTS5120 has a three-year warranty with one year of on-site service.—CL

HiNote VP CSS5100. Street price: \$2,499. **HiNote VP CTS5100.** Street price: \$2,999. **HiNote Ultra II CTS5120.** Street price: \$4,799. Digital Equipment Corp., Maynard, MA; 800-642-4532; fax, 800-652-4532; <http://www.pc.digital.com>. Circle 510 on reader service card.

SERVICE & RELIABILITY

Digital Equipment Corp.

Reliability	Average
Repair	Average
Technical support	Average
Percent needing repair	Average

A man in a dark trench coat and a fedora-style hat stands on a wooden bridge or walkway, leaning over the railing and looking out at a calm body of water. The background is filled with trees and their reflection in the water. The overall tone is sepia or monochromatic, giving it a classic, timeless feel.

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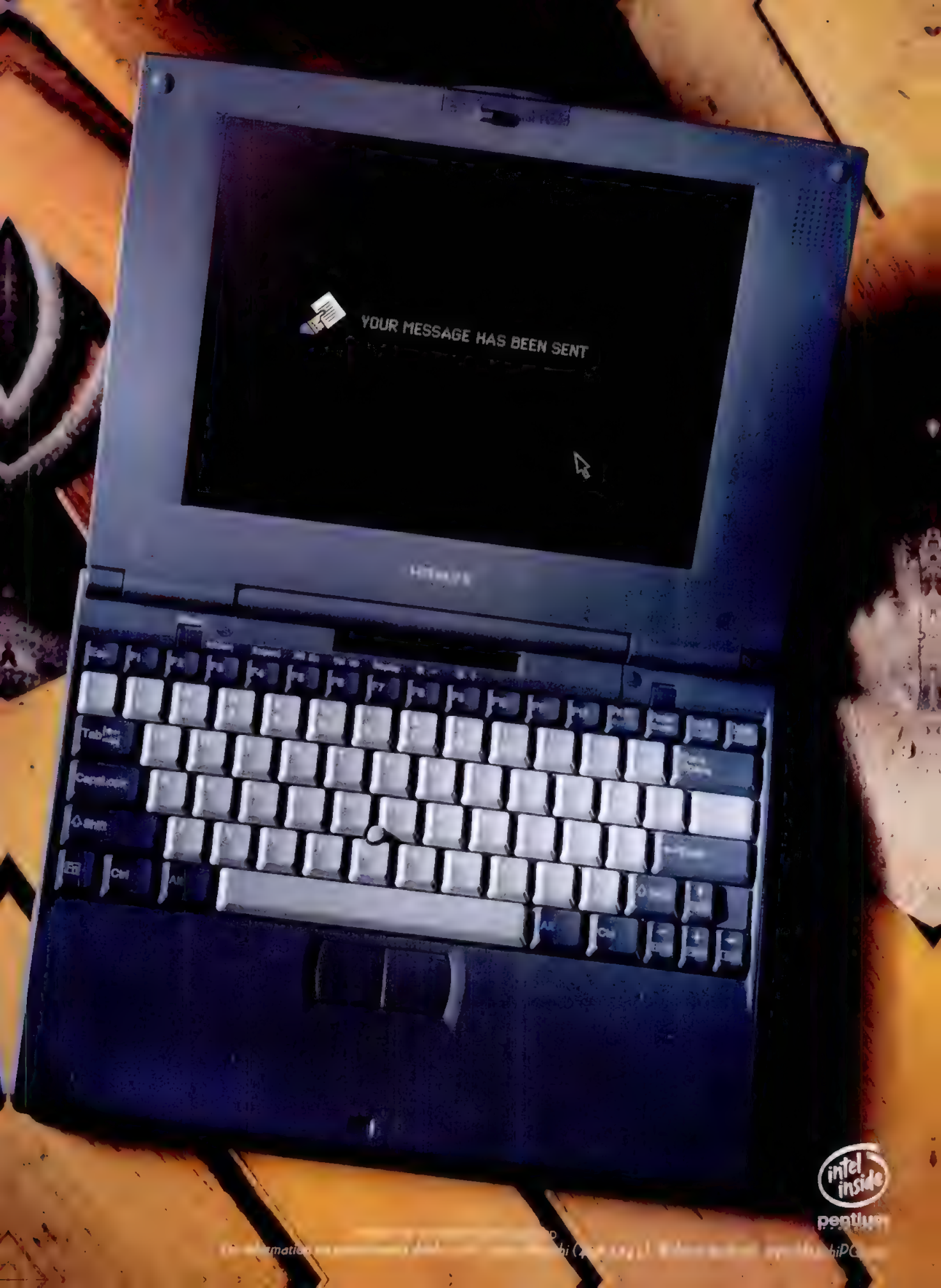
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Remote Control

Hitachi PC Series C Notebook available with 11.8" active matrix screen, Pentium® 120 MHz chip
Series M Notebook comes with built-in LAN port. Available with 11.8" active matrix screen and Pentium® 133 MHz chip

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YOUR MESSAGE HAS BEEN SENT

TOSHIBA



DTK Computing Inc.

DTK DTN-5P120C

The \$3,600 DTK DTN-5P120C, from DTK Computing, has a lot to offer those in search of a desktop replacement. This 120-MHz unit offers top-level graphics performance and plenty of hard disk capacity for the high-end business presentation user.

On our benchmark tests, the DTN-5P120C was mainly average compared to other presentation notebooks, with the exception of a below-average Winstone 32 score. The DTN-5P120C uses a Duracell nickel hydride smart battery, but it lasted just 1:30 on our BatteryMark test.

The unit offers a 10.4-inch active-matrix SVGA display, a 1.3GB hard disk, and a built-in 4X CD-ROM drive. In addition to standard I/O ports, the DTN-5P120C has an IrDA infrared port, a game/MIDI port, and a docking station connector. Graphics are handled with 1MB of DRAM and a Chips and Technologies 65548 graphics chip set; audio is based on a 16-bit FM synthesis audio subsystem. A 28.8/28.8-Kbps PC Card fax modem is included.

Not surprisingly, the unit's wealth of multimedia features comes at the cost of heat and heft. A small fan keeps the inside cool; 9 pounds of travel weight makes it one of the heaviest reviewed.

This notebook is essentially the same as the Broadax Systems BSI NP8662T and the Micro Express NP8600-P120, also reviewed in this roundup. DTK backs the DTN-5P120C with a one-year warranty.—RSA

DTN-5P120C. Street price: \$3,600. DTK Computer Inc., City of Industry, CA; 800-289-2385, 818-810-0098; fax, 818-810-0090; <http://www.dtk.com>. *Circle 511 on reader service card.*

Ergo Computing Inc.

CD-PowerBrick

Ergo Computing positions its \$4,195, Pentium/120-based CD-PowerBrick presentation notebook as an all-in-one solution for multimedia software users. The system offers an 11.3-inch active-matrix SVGA display, a 4X CD-ROM drive, a Sound Blaster Pro-compatible 16-bit audio subsystem, and a removable 776MB Toshiba hard disk. The CD-PowerBrick is essentially the same machine as Hertz's Z-Optima NB P150C and Maxtech Corp.'s YesBook Model X753, also in this roundup.

The CD-PowerBrick posted average results on the CD-ROM WinMark 96 tests and a below-average Graphics WinMark 96 score, despite a Cirrus Logic CL-



DTK, Ergo, FutureTech.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
DTK DTN-5P120C	Good	Fair
Ergo CD-PowerBrick	Good	Good
FutureTech FutureMate 5813T	Good	Good

GD7543 graphics chip set and 2MB of DRAM. Other test scores were average. The unit's nickel hydride battery lasted 1:51 on our BatteryMark test.

The CD-PowerBrick includes an NTSC- and PAL-compatible video-out port, a game/MIDI port, an IrDA-compliant infrared port, and a docking station connector. With a travel weight of 8.7 pounds and a thickness of 2.3 inches, the system is neither light nor slim. However, the unit can accommodate one Type II or one Type III PC Card. A 28.8/14.4-Kbps PC Card fax modem is standard. A Windows 95 tutorial CD

augments two Windows 95-specific keys.

Ergo offers a stellar four-year parts-and-labor warranty, with on-site service supplied by GE for the second, third, and fourth years.—RSA

CD-PowerBrick. Street price: \$4,195. Ergo Computing Inc., Peabody, MA; 800-880-1925, 508-535-7510; fax, 508-535-7512; <http://ergocomputing.com>. *Circle 512 on reader service card.*

FutureTech Systems Inc.

FutureMate 5813T

The modular components and strong graphics performance of FutureTech Systems' \$3,329, 133-MHz FutureMate 5813T make it a good choice for mobile presentations. The unit, with its 12.1-inch active-matrix SVGA display, is meant as a power machine for heavy multimedia software users. The 5813T is similar to All Computer Warehouse's ACW ND5123T, reviewed elsewhere in this roundup.

The 5813T has two modular bays. One houses either a floppy disk drive or a nickel hydride battery, the other—with the aid of a plastic adapter—a 4X CD-ROM drive module (a 6X drive is available for an additional \$100) or another battery.

The 5813T offers a game/MIDI port, an infrared port, an expansion connection, and separate mouse and external keyboard ports. A palm rest is home to a touch pad and two speakers, and the full-size keyboard has two Windows 95-specific keys. The system also comes with 16-bit audio, a 776MB hard disk, and a cellular-capable 28.8/14.4-Kbps PC Card fax modem.

Using Chips and Technologies' 65550 graphics chip set with 1MB of VRAM (2MB of EDO DRAM are now standard), the unit posted a Graphics WinMark 96 score that was one of this roundup's best. Its Winstone 96 score was also above average; other scores were average. The unit, which has an 8.4-pound travel weight, lasted 1:33 on our BatteryMark test.

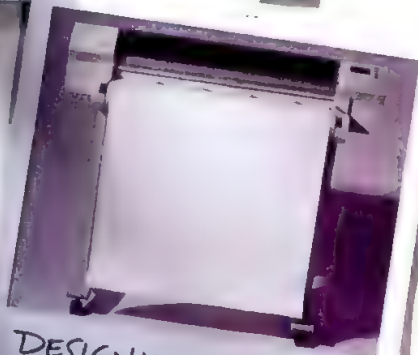
The 5813T has a one-year warranty; on-site service costs \$250 for three years and is available after the first year.—RSA
FutureMate 5813T. Street price: \$3,329. FutureTech Systems Inc., Hackensack, NJ; 800-275-4414, 201-488-4414; fax, 201-488-4405; futuretk@styx.ios.com. *Circle 513 on reader service card.*



LASERJET PRINTERS



DESKJET PRINTERS



DESIGNJET PRINTERS

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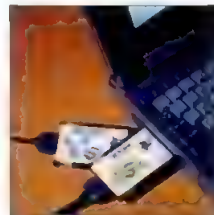
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FUJITSU

Gateway 2000 Inc.
**Solo S5-120,
Solo S5-133**

Gateway 2000's \$4,499 presentation-class Solo S5-133 and \$4,128 high-end value Solo S5-120 (both direct prices) are intended to be complete, multimedia-ready, lightweight notebooks for computing travelers. With travel weights of less than 7.5 pounds, a high degree of modularity, and competitive performance, the Solos succeed.

If you wish to purchase an S5-133 or S5-120 as reviewed here, make sure to list its components; the default configurations

SERVICE & RELIABILITY

Gateway 2000 Inc.

Reliability	Average
Repair	Average
Technical support	Better than average
Percent needing repair	Average

are those of the Solo S5-133XL Best Buy and the Solo S5-120XL Best Buy, which are different.

Both Solos have the same internal components, including the OPTi

Viper chip set on the motherboard, 256K of pipelined-burst processor cache, and Chips and Technologies' 65548 graphics chip set. Each unit also features a lithium ion battery, a 16-bit audio subsystem, a 28.8-Kbps PC Card modem, and a 6X Matsushita CD-ROM drive, which can be replaced by a floppy disk drive. The Solos also have an 115.2-Kbps infrared interface; an IR desktop module is available



Gateway S5-133, Hertz NB P150c.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
Gateway Solo S5-120	Good	Good
Gateway Solo S5-133	Good	Good
Hertz Z-Optima NB P150c	Good	Good

SUMMARY OF FEATURES

Pentium Notebooks

Price of tested configuration For notebooks sold through resellers, assume that street prices will be 15 to 20 percent lower than list prices. Some companies factor this discount into their quoted prices; in such cases, we indicate that the cited price is a street price. Companies which sell directly to consumers have direct prices, with no expected discounting.

System weight, travel weight The system weight includes the weight of the battery. The travel weight adds the weight of the AC adapter, the power cord, and the CD-ROM drive. It does not include the weight of an external floppy disk drive or a floppy disk drive that swaps for the CD-ROM drive.

Virtual desktop When you use a notebook's LCD panel and an external monitor simultaneously, virtual desktop lets you display a higher resolution on the external monitor than the LCD panel is normally capable of producing

Installed/maximum hard disk capacity We report capacity in megabytes (units of 1,048,576

bytes). Some manufacturers quote millions of bytes (which makes capacity appear about 5 percent larger) on spec sheets

NTSC video in/out These ports meet specifications set by the National Television Standards Committee, and allow you to input directly from or output directly to a television set

PC Card slots These were formerly called PCMCIA slots

Battery hot-swapping/Smart battery Systems with battery hot-swapping capability let you change batteries without shutting down or losing data. A smart battery contains intelligent electrical circuitry that more accurately measures remaining battery capacity and provides this information to the system

All notebooks in this roundup are capable of simultaneous external display, and all have serial, parallel, and VGA ports.

for \$79. Both also include Microsoft Office Professional for Windows 95.

The 133-MHz S5-133 features an IBM 686MB hard disk, an 11.3-inch active-matrix SVGA screen and two speakers, which are located on the hinges of the display panel. The unit earned average scores for its class on all of our benchmark

tests and a timing of 2:29 on our BatteryMark test.

The S5-120 had a Toshiba hard disk nearly twice the size of its sibling (1.2GB), but a smaller 10.4-inch active-matrix screen. Its performance was good: Results across all of our benchmark tests were average. It lasted 2:52 on our BatteryMark test.

Gateway backs the two Solo notebooks with a one-year parts-and-labor warranty.—*Frank J. Evans*

Solo S5-133. Direct price: \$4,499. **Solo S5-120.** Direct price: \$4,128. Gateway 2000, North Sioux City, SD; 800-846-2000, 605-232-2000; fax, 605-232-2023; <http://www.gw2k.com>. *Circle 514 on reader service card.*

Hertz Computer Corp.

Z-Optima NB P150c

The Z-Optima NB P150c (\$3,995 direct), from Hertz Computer Corp., is one of three 150-MHz notebooks in a field of mostly 100- to 133-MHz units. Its high level of processing power earned it average scores in the presentation class on our benchmark tests. Hertz markets the Z-Optima as an all-in-one multimedia solution; it is essentially the same as Ergo Computing's CD-PowerBrick and Max-Tech's YesBook Model X753, also reviewed in this roundup.

The Z-Optima has some impressive components. A Cirrus Logic CL-GD7543 graphics chip set and 2MB of DRAM drive the 11.2-inch active-matrix SVGA display, and storage needs are met by a 1GB Quantum hard disk. The unit also features a fixed 4X CD-ROM

SUMMARY OF FEATURES

Color Pentium Notebooks



■ YES ■ NO

Products listed in alphabetical order

	Acer Note Light	ACW ND5123T	AMS SoundPro P54	AMS PowerCD 8500	AMS PowerCD 8550	ARMNote TS30CP90T	ARMNote TS80CD133TX	AST Ascentia J50
Category	High-end value	Presentation	Low-end value	High-end value	Presentation	High-end value	Presentation	High-end value
Price (tested configuration)	\$2,699 (street)	\$3,489 (direct)	\$2,480 (street)	\$3,325 (street)	\$4,395 (street)	\$2,699 (direct)	\$3,699 (direct)	\$3,499 (street)
System weight/Travel weight (pounds)	5.8, 6.6	7.2, 8.5	6.4, 7.7	7.2, 8.5	7.5, 8.8	6.0, 6.9	7.2, 8.1	5.7, 6.5
Dimensions (HWD, in inches)	2.0 x 11.8 x 8.3	2.3 x 11.8 x 10.1	2.0 x 11.0 x 13.8	2.3 x 11.8 x 8.8	2.3 x 11.8 x 8.8	2.0 x 11.0 x 8.8	2.0 x 11.5 x 8.8	2.0 x 11.3 x 8.8
Motherboard Components								
Processor type and speed	Pentium/100	Pentium/133	Pentium/100	Pentium/120	Pentium/133	Pentium/90	Pentium/133	Pentium/133
Installed/maximum system RAM	16MB EDO, 40MB	16MB, 32MB	16MB, 40MB	16MB, 40MB	16MB, 40MB	16MB, 40MB	16MB, 64MB	16MB EDO, 40MB
Installed external RAM cache and type	N/A	256K pipelined-burst	256K asynchronous	256K pipelined-burst	256K pipelined-burst	256K pipelined-burst	256K synchronous	256K pipelined-burst
Motherboard manufacturer	Acer	Dual Technology	AMS	AMS	AMS	Compal	Twinhead	Compal
Chip set manufacturer and model	ALI M1511	SiS 5101, 5102, 5103	ACC Micro 2056	ACC Micro 2057	ACC Micro 2057	VLSI 82C594	SiS 85C5501, 5502, 5503	Intel 82430MX
BIOS manufacturer and version (or date)	Acer 2.0	AMI 2.0	Phoenix 1.03	Phoenix 4.04	Phoenix 4.04	Phoenix 4.04	Phoenix 4.04	Phoenix 4.0
Flash BIOS/Plug and Play BIOS	■ ■	■ ■	■ ■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Display								
LCD-panel specifications	10.4" active-matrix SVGA	12.1" active-matrix SVGA	10.4" dual-scan VGA	10.4" active-matrix SVGA	11.2" active-matrix SVGA	10.4" active-matrix SVGA	11.3" active-matrix SVGA	10.4" active-matrix SVGA
Graphics chip set manufacturer and model	C&T 65545	C&T 65550	C&T 65550	Cirrus Logic CL-GD7543	Cirrus Logic CL-GD7543	C&T 65548	Cirrus Logic CL-GD7543	C&T 65548
Graphics RAM and type	1MB DRAM	2MB EDO DRAM	1MB DRAM	2MB VRAM	2MB VRAM	1MB VRAM	1MB VRAM	1MB DRAM
Resolutions and noninterlaced refresh rates supported on external display	800 x 600 at 75 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 70 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 72 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 72 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 72 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 68 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 56 Hz, 1,024 x 768 at 60 Hz
Virtual desktop	■	■	■	■	■	■	■	■
Mass Storage								
Hard disk manufacturer and model	IBM DSOA-20810	Toshiba MK2720FC	Toshiba MK1926FCV	Toshiba MK1926FCV	Toshiba MK2720FC	Toshiba MK1926FCV	Toshiba MK2720FC	IBM DSOA-20810
Installed/maximum hard disk capacity	774MB, 1GB	1.3GB, 1.3GB	776MB, 2GB	776MB, 2GB	1.3GB, 1.3GB	774MB, 1.3GB	1.3GB, 1.3GB	774MB, 1.3GB
Floppy disk drive	Internal	Swappable	Internal	Swappable	Swappable	Internal	Swappable	Internal
Multimedia Features								
CD-ROM manufacturer and model	None	TEAC CD-44E	None	Toshiba XM-1102B	Toshiba XM-1302B	None	Matsushita UJDCD4731	None
CD-ROM speed and interface	N/A	4X ATAPI	N/A	2X ATAPI	4X ATAPI	N/A	4X ATAPI	N/A
Sound synthesis	FM	FM, wavetable	FM	FM	FM	FM, wavetable	FM	FM
Built-in speakers	■	■	■	■	■	■	■	■
Line-in/line-out jacks	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Microphone/speaker jacks	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
NTSC video in/out	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Communications and Expansion								
Type of modem	PC Card	PC Card	PC Card	PC Card	PC Card	PC Card	PC Card	Integrated
Infrared interface	■	■	■	■	■	■	■	■
External keyboard and mouse ports	Shared port	Both	Shared port	Shared port	Shared port	Shared port	Shared port	Shared port
16550 UART/ECP/EPP support	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
PC Card slots	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III
Input Devices								
Full-size alphanumeric/cursor keys	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Type of integrated pointing device	Touch pad	Touch pad	Trackball	Touch pad	Touch pad	Touch pad	Touch pad	Pointing stick
Power								
Battery type	Nickel hydride	Nickel hydride	Nickel hydride	Nickel hydride	Nickel hydride	Nickel hydride	Lithium ion	Lithium ion
Rated charge time while on/off (hours:minutes)	5:00, 1:00	3:00, 1:30	6:00, 2:30	N/A, 2:00	N/A, 2:00	4:00, 1:30	N/A, 2:00	5:00, 2:30
Standby/hibernation mode	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Battery hot-swapping/Smart battery	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Service and Support								
Standard warranty on parts/labor	3 years/3 years	1 year/1 year	3 years/3 years	3 years/3 years	3 years/3 years	1 year/3 years	1 year/3 years	3 years/3 years
On-site service charge (first year)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$60.00
24-hour, 7-day live technical support	■	■	■	■	■	■	■	■

N/A—Not applicable. The product does not have this feature.



**AST
Ascentia P50**

Presentation
\$4,499 (street)
7.5, 8.3
2.3 x 11.3 x 9.0

Pentium/133
16MB EDO, 40MB
256K pipelined-burst
Quanta
Intel 82430MX

Phoenix (2/16/96)



11.3" active-matrix SVGA
Cirrus Logic CL-GD7543
1MB DRAM
800 x 600 at 70 Hz, 1,024 x 768 at 70 Hz

Toshiba MK1926FCV
774MB, 2.1GB
Swappable

TEAC CD-44E

4X ATAPI

FM



Integrated



Shared port



One Type II/III and one Type II



Touch pad

Lithium ion

5:00, 2:30



3 years/3 years

\$60.00



Austin Edge CD

High-end value
\$4,171 (street)
7.7, 8.4
2.3 x 11.3 x 9.0

Pentium/133
16MB EDO, 40MB
256K pipelined-burst
Quanta
Intel 82430MX

Phoenix 4.0



11.4" active-matrix SVGA
Cirrus Logic CL-GD7543
2MB VRAM
800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz

Toshiba MK2720FC
1.3GB, 2GB
Swappable

TEAC CD-44E

4X ATAPI

FM



PC Card



Shared port



One Type II/III and one Type II



Touch pad

Lithium ion

6:00, 4:00



1 year/1 year

N/A



BSI NP8657D

Low-end value
\$2,605 (street)
8.0, 9.1
2.3 x 11.8 x 9.3

Pentium/75
16MB, 40MB
256K synchronous
Nan Tan
UMC 8890

SystemSoft 1.01



11.3" dual-scan SVGA
C&T 65548
1MB DRAM
800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz

Seagate ST9816AG
772MB, 810MB
Internal

Toshiba XM-1302B

4X ATAPI

FM



PC Card



Shared port



One Type II/III and one Type II



Touch pad

Nickel hydride

4:00, 2:00



1 year/1 year

N/A



BSI NP8662T

High-end value
\$3,170 (street)
7.9, 9.1
2.3 x 11.8 x 9.3

Pentium/120
16MB, 40MB
256K synchronous
Nan Tan
UMC 8890

SystemSoft 1.01



10.4" active-matrix SVGA
C&T 65548
1MB DRAM
800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz

Toshiba MK2720FC
1.3GB, 1.3GB
Internal

Toshiba XM-1302B

4X ATAPI

FM



PC Card



Shared port



One Type II/III and one Type II



Touch pad

Nickel hydride

4:00, 2:00



1 year/1 year

N/A



BSI NP5265A

Presentation
\$3,765 (street)
8.2, 9.3
2.5 x 12.0 x 9.0

Pentium/150
16MB, 32MB
256K asynchronous
Kapok
UMC 8890

SystemSoft (5/16/95)



12.1" active-matrix SVGA
Cirrus Logic CL-GD7543
2MB EDO DRAM
800 x 600 at 60 Hz, 1,024 x 768 at 70 Hz

Toshiba MK2720FC
1.3GB, 1.3GB
Internal

TEAC CD-44E

4X ATAPI

FM



PC Card



Keyboard only



Two Type II or one Type III



Touch pad

Nickel hydride

3:30, 3:30



1 year/1 year

N/A



Canon Innova Book 360CD

Low-end value
\$3,369 (street)
6.6, 7.5
2.0 x 11.8 x 8.8

Am5x86-P75
16MB, 32MB
N/A
Featurtron
Pico Power Redwood
Phoenix 1.03

Phoenix 1.03



10.4" dual-scan VGA
C&T 65545
1MB VRAM
800 x 600 at 75 Hz, 1,024 x 768 at 60 Hz

Toshiba MK1926FCV
776MB, 1.2GB
Swappable

TEAC CD-44E

4X ATAPI

FM



PC Card



Shared port



Two Type II or one Type III



Touch pad

Nickel hydride

2:30, 1:30



1 year/1 year

N/A



ChemBook 5400 Dual

Low-end value
\$3,075 (street)
8.2, 9.3
2.5 x 11.8 x 9.0

Pentium/75
16MB, 32MB
256K asynchronous
Kapok
UMC 8890

SystemSoft 1.10



11.4" dual-scan SVGA
Cirrus Logic CL-GD7543
2MB VRAM
800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz

Hitachi DK212A-81
773MB, 810MB
Internal

TEAC CD-44E

4X ATAPI

FM



PC Card



Shared port



Two Type II or one Type III



Touch pad

Nickel hydride

4:30, 2:30



1 year/1 year

N/A



ChemBook 5400 TFT

High-end value
\$4,000 (street)
8.2, 9.3
2.5 x 11.8 x 9.0

Pentium/150
16MB EDO, 32MB
256K asynchronous
Kapok
UMC 8890

SystemSoft 1.10



12.1" active-matrix SVGA
Cirrus Logic CL-GD7543
2MB VRAM
800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz

Toshiba MK2720FC
1.3GB, 1.3GB
Internal

TEAC CD-44E

4X ATAPI

FM



PC Card



Shared port



Two Type II or one Type III



Touch pad

Nickel hydride

4:30, 2:30



1 year/1 year

N/A



Compaq LTE 5300

Presentation
\$6,647 (street)
7.5, 8.3
2.0 x 12.3 x 9.0

Pentium/133
16MB, 80MB
256K pipelined-burst
Compaq
OPTi Viper

SystemSoft (3/19/96)



12.1" active-matrix SVGA
Cirrus Logic CL-GD7543
1MB EDO DRAM
800 x 600 at 75 Hz, 1,024 x 768 at 72 Hz

Toshiba MK2720FC
1.3GB, 1.3GB
Swappable

TEAC CD-44E

4X ATAPI

FM



PC Card



Shared port



Two Type II or one Type III



Pointing stick

Nickel hydride

1:30, 1:30



3 years/3 years

N/A



Dell Latitude XPI P100SD

Low-end value
\$3,459 (direct)
6.0, 6.9
2.3 x 11.0 x 8.8

Pentium/100
16MB, 40MB
256K synchronous
Dell
Pico Power Vesuvius-LS

Phoenix/Dell 1.10



10.3" dual-scan SVGA
NeoMagic Magic-Graph NM2070
1MB DRAM

Two More Reasons Why Nim

12.1" SVGA Active Matrix Screen

Quanta 6X 120

- ✓ 120 MHz Pentium® Processor
 - ✓ 12.1" Super VGA Active Matrix Screen
 - ✓ 16MB RAM
 - ✓ 810MB Hard Drive
 - ✓ Lithium-Ion Battery
 - ✓ Optional 4X or 6X Modular CD-ROM
- (CD-ROM additional. Interchangeable with Modular Standard 3.5" Floppy Drive-included or second Internal Lithium-Ion Battery for an additional charge.)



\$3499

Price Does Not Include Shipping/Handling



Quanta 6X 120 System Also Includes:

- 120 MHz Pentium® Processor
(Upgradable to 133 MHz Pentium® Processor)
- 16MB RAM
(Upgradable to 40MB RAM)
- 810MB Hard Drive
(Upgradable to 2 GB Hard Drive)



- Modular 3.5" 1.44MB Floppy
- Internal Lithium-Ion Battery
- Advanced Power Management
- AC Charger
- Windows® 95 Keyboard
- Deluxe Carrying Case

Both Fully-Loaded Systems Include the Perfo

1

SCREEN & VIDEO

12.1" Super VGA
Active Matrix Screen
(14% MORE viewing area
than an 11.3" Screen)

32-Bit PCI Video Bus with
Windows Acceleration
800 x 600 Resolution



2

CD QUALITY AUDIO

Built-in 16-Bit Stereo Sound
Built-in Stereo Speakers
Built-in Microphone

SoundBlaster Pro Compatible

3

PCMCIA EXPANDABILITY

One Type II and One Type III Slot
(Orion features Two Type II
or One Type III Slot)

Ready to add Fax/Modem
or LAN Adapter Cards



NIMANTICS

TOMORROW AND BEYOND

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antics is the ^{New}Laptop Leader

150 MHz Pentium® Processor

Orion 6X 150

- ✓ 150 MHz Pentium® Processor
- ✓ 12.1" Super VGA Active Matrix Screen
- ✓ 32MB RAM
- ✓ 2100MB Hard Drive (=2.1GB=2.1 Billion Bytes)
- ✓ Simultaneous Internal 6X CD-ROM Drive and 3.5" 1.44MB Floppy Drive
- ✓ 2MB PCI Video RAM



\$4999

Price Does Not Include Shipping/Handling



THE LONGEST WARRANTY PROTECTION AVAILABLE!

Optional "Mega" Warranty adds 36 months of nationwide on-site coverage through General Electric.

(In addition to the standard 12 month Nimantics warranty)

(Additional charges Apply. Call for details.)



Performance You Need and the Features You Want:

4

PORTS & JACKS

- Parallel Port
- Serial Port
- Infrared Port
- External Microphone Jack
- External Speaker Jack
- 1 Line-In/Line-Out Jack
- 1 External CRT Port
- External Keyboard Port PS/2

5

PERFORMANCE EXTRAS

- Windows® 95 Pre-Installed
- PCI Plug and Play BIOS
- 256K Level 2 Cache RAM
- Touchpad Pointing Device

6

SERVICE & SUPPORT

Every Nimantics Laptop is protected by the Nimantech Service & Support Program – including One Year Parts and Labor and One Year FREE Technical Support.



CIRCLE 263 ON READER SERVICE CARD

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Orion 6X Laptop Systems

ORION 6X 133

- Intel 133 MHz Pentium® Processor
- 16MB RAM
- 810MB Hard Drive

\$3999

Orion 6X 150

- Intel 150 MHz Pentium® Processor
- 32MB RAM
- 2.1GB Hard Drive

\$4999

- Built-in Internal 6X CD-ROM and Internal 3.5" 1.44MB Floppy
- Internal NiHM Battery (Optional 5.7" 6W Rear Battery Available)
- Advanced Power Management
- AC Charger
- Deluxe Carrying Case



The Orion 6X Product Family is available in a variety of custom-configured options starting at \$2999

SUMMARY OF FEATURES

Color Pentium Notebooks

■ YES ■ NO

Products listed in alphabetical order

	Dell Latitude XPI P133ST	DFI 7200TC	Digital HiNote VP CSS5100	Digital HiNote VP CTS5100	Digital HiNote Ultra II CTS5120	DTK DTN- 5P120C	Ergo CD- PowerBrick	FutureMate 5813T
Category	High-end value	Presentation	Low-end value	High-end value	Lightweight	Presentation	Presentation	Presentation
Price (tested configuration)	\$4,859 (direct)	\$4,199 (street)	\$2,499 (street)	\$2,999 (street)	\$4,799 (street)	\$3,600 (street)	\$4,195 (street)	\$3,329 (street)
System weight/Travel weight (pounds)	6.0, 6.9	7.1, 8.1	6.0, 6.7	6.0, 6.7	4.0, 4.7	7.9, 9.0	7.6, 8.7	7.1, 8.4
Dimensions (HWD, in inches)	2.3 x 11.0 x 8.8	2.3 x 11.5 x 8.8	1.8 x 11.0 x 9.0	1.9 x 11.0 x 9.0	1.3 x 11.0 x 8.8	2.3 x 11.8 x 9.2	2.3 x 11.8 x 8.9	2.3 x 11.8 x 10.1
Motherboard Components								
Processor type and speed	Pentium/133	Pentium/133	Pentium/100	Pentium/100	Pentium/120	Pentium/120	Pentium/120	Pentium/133
Installed/maximum system RAM	16MB, 40MB	16MB, 64MB	16MB EDO, 40MB	16MB EDO, 40MB	16MB, 40MB	16MB, 40MB	16MB, 40MB	16MB EDO, 32MB
Installed external RAM cache and type	256K synchronous	256K asynchronous	N/A	N/A	256K pipelined-burst	256K synchronous	256K synchronous	256K pipelined-burst
Motherboard manufacturer	Dell	Twinhead	Compal	Compal	Full Power Investment	Nan Tan	GVC	Dual Technology
Chip set manufacturer and model	Pico Power Vesuvius-LS	SiS 83C5501	Intel 82430MX	Intel 82430MX	Cirrus Logic Golden Gate	UMC 8890	OPTi Viper	SiS 5101, 5102, 5103
BIOS manufacturer and version (or date)	Phoenix 1.10 A00	Phoenix 4.04	Phoenix 4.0	Phoenix 4.0	SystemSoft 2.03	SystemSoft 1.01	Phoenix 4.0	AMI (3/21/96)
Flash BIOS/Plug and Play BIOS	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Display								
LCD-panel specifications	11.3" active-matrix SVGA	10.4" active-matrix SVGA	10.4" dual-scan SVGA	10.4" active-matrix SVGA	10.4" active-matrix SVGA	10.5" active-matrix SVGA	11.3" active-matrix SVGA	12.1" active-matrix SVGA
Graphics chip set manufacturer and model	NeoMagic Magic-Graph NM2070	Cirrus Logic CL-GD7543	C&T 65548	C&T 65548	C&T 65548	C&T 65548	Cirrus Logic CL-GD7543	C&T 65550
Graphics RAM and type	1MB EDO DRAM	1MB DRAM	1MB VRAM	1MB VRAM	1MB SDRAM	1MB DRAM	2MB DRAM	1MB VRAM
Resolutions and noninterlaced refresh rates supported on external display	800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 56 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 56 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 56 Hz, 1,024 x 768 at 70 Hz	800 x 600 at 56 Hz, 1,024 x 768 at 70 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 60 Hz
Virtual desktop	■	■	■	■	■	■	■	■
Mass Storage								
Hard disk manufacturer and model	IBM DPRA-21215	Toshiba MK2720FC	IBM DSOA-20810	IBM DSOA-20810	IBM DSOA-21080	Toshiba MK2720FC	Toshiba MK1926FCV	Toshiba MK1926FCV
Installed/maximum hard disk capacity	1.2GB, 1.2GB	1.3GB, 1.3GB	774MB, 1.3GB	774MB, 1.3GB	1GB, 1.3GB	1.3GB, 1.3GB	776MB, 1GB	776MB, 1.3GB
Floppy disk drive	Internal	Swappable	Swappable	Swappable	Swappable	Internal	Internal	Swappable
Multimedia Features								
CD-ROM manufacturer and model	None	Matsushita UJDCD4731	None	None	Toshiba XM-1202B	Toshiba XM-1302B	TEAC CD-44E	TEAC CD-44E
CD-ROM speed and interface	N/A	4X ATAPI	N/A	N/A	4X ATAPI	4X ATAPI	4X ATAPI	4X ATAPI
Sound synthesis	FM	FM	FM	FM	FM	FM	FM	FM
Built-in speakers	■	■	■	■	■	■	■	■
Line-in/line-out jacks	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Microphone/speaker jacks	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
NTSC video in/out	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Communications and Expansion								
Type of modem	PC Card	PC Card	PC Card	PC Card	PC Card	PC Card	PC Card	PC Card
Infrared interface	■	■	■	■	■	■	■	■
External keyboard and mouse ports	Shared port	Shared port	Shared port	Shared port	Shared port	Shared port	Shared port	Both
16550 UART/ECP/EPP support	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
PC Card slots	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	One Type II/III and one Type II	Two Type II or one Type III	Two Type II or one Type III
Input Devices								
Full-size alphanumeric/cursor keys	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Type of integrated pointing device	Trackball	Touch pad	Touch pad	Touch pad	Trackball	Touch pad	Touch pad	Touch pad
Power								
Battery type	Lithium ion	Lithium ion	Nickel hydride	Nickel hydride	Lithium ion	Nickel hydride	Nickel hydride	Nickel hydride
Rated charge time while on/off (hours:minutes)	2:30, 2:30	9:00, 2:00	3:50, 2:00	3:50, 2:00	3:00, 3:00	4:00, 2:00	2:10, 1:30	3:00, 2:00
Standby/hibernation mode	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Battery hot-swapping/Smart battery	■ ■	■ ■	■ ■	■	■ ■	■ ■	■ ■	■ ■
Service and Support								
Standard warranty on parts/labor	3 years/1 year	1 year/3 years	1 year/1 year	1 year/1 year	3 years/3 years	1 year/1 year	4 years/4 years	1 year/1 year
On-site service charge (first year)	N/A	N/A	\$49.00	\$49.00	Included	N/A	N/A	N/A
24-hour, 7-day live technical support	■	■	■	■	■	■	■	■

N/A—Not applicable: The product does not have this feature.

COVER STORY
Pentium Notebooks

Continues

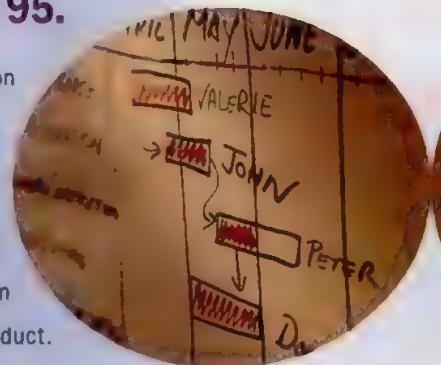


Gateway Solo S5-120	Gateway Solo S5-133	Hertz Z-Optima NB P150c	HP OmniBook 5500 CS	HP OmniBook 5500 CT	IBM ThinkPad 365XD	IBM ThinkPad 560	IBM ThinkPad 760ED	Keydata Keynote GT	Maximus MediaNote CD Book
High-end value \$4,128 (direct) 6.4, 7.5 2.0 x 11.8 x 8.8	Presentation \$4,499 (direct) 5.6, 6.6 2.0 x 11.8 x 8.8	Presentation \$3,995 (direct) 8.0, 9.0 2.3 x 11.9 x 9.0	Low-end value \$3,700 (street) 7.2, 8.0 2.0 x 12.0 x 9.0	Presentation \$6,120 (street) 7.1, 8.0 2.0 x 11.5 x 9.0	High-end value \$3,699 (street) 6.3, 7.2 2.0 x 11.6 x 8.3	Lightweight \$3,749 (street) 4.1, 4.8 1.3 x 11.8 x 8.8	Presentation \$6,999 (street) 7.5, 8.1 2.3 x 11.6 x 8.5	High-end value \$3,795 (direct) 7.1, 8.0 2.3 x 11.8 x 8.8	High-end value \$3,795 (direct) 7.6, 8.9 2.5 x 11.8 x 9.3
Pentium/120 16MB, 40MB 256K pipelined-burst Sanyo OPTi Viper SystemSoft 1.07	Pentium/133 16MB, 40MB 256K pipelined-burst Sanyo OPTi Viper SystemSoft 1.07	Pentium/150 16MB EDO, 40MB 256K pipelined-burst GVC OPTi Viper Phoenix 4.0	Pentium/100 16MB EDO, 64MB 256K pipelined-burst Twinhead OPTi Viper SystemSoft 2.0	Pentium/133 16MB EDO, 64MB 256K pipelined-burst Twinhead OPTi Viper SystemSoft 2.0	Pentium/120 16MB EDO, 40MB N/A IBM Intel 82430MX IBM 1.03	Pentium/120 16MB EDO, 40MB N/A IBM Intel 82430MX IBM 1.03	Pentium/133 16MB EDO, 80MB 256K pipelined-burst IBM Intel 82430MX IBM 1.03	Pentium/120 16MB EDO, 72MB 256K asynchronous Chicony OPTi Viper Phoenix 4.0	Pentium/133 16MB, 64MB 256K asynchronous Sunrex VIA VT82C575, 576, 577 AMI (3/26/96)
10.4" active-matrix SVGA C&T 65548 1MB VRAM 800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz	11.3" active-matrix SVGA C&T 65548 1MB VRAM 800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz	11.2" active-matrix SVGA Cirrus Logic CL-GD7543 2MB DRAM 800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	11.4" dual-scan SVGA C&T 65550 1MB DRAM 800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	12.1" active-matrix SVGA C&T 65550 1MB DRAM 800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	10.4" active-matrix SVGA Trident Cyber9320 1MB DRAM 800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz	12.1" active-matrix SVGA Trident Cyber9382 1MB VRAM 800 x 600 at 85 Hz, 1,024 x 768 at 85 Hz	12.1" active-matrix SVGA Trident Cyber9385 2MB VRAM 800 x 600 at 85 Hz, 1,024 x 768 at 75 Hz	12.0" active-matrix SVGA C&T 65548 1MB DRAM 800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz	12.1" active-matrix SVGA C&T 65548 1MB DRAM 800 x 600 at 60 Hz, 1,024 x 768 at 54 Hz
Toshiba MK2720FC 1.2GB, 2GB Swappable	IBM DBOA-2720 686MB, 2GB Swappable	Quantum Europa1080A 1GB, 1.3GB Internal	Toshiba MK1926FCV 1.3GB, 1.3GB Swappable	Toshiba MK2720FC 1.3GB, 1.3GB Swappable	IBM DSOA-21080 1GB, 1.1GB Swappable	IBM DSOA-20810 774MB, 1.1GB External	IBM DPRA-21215 1.2GB, 1.2GB Swappable	Toshiba MK2720FC 1.3GB, 1.3GB Swappable	Toshiba MK2720FC 1.3GB, 1.3GB Internal
Matsushita UJDCD4720 6X ATAPI FM	Matsushita UJDCD4720 6X ATAPI FM	TEAC CD-44E 4X ATAPI FM	Toshiba XM-1302B 4X ATAPI FM, wavetable	Toshiba XM-1302B 4X ATAPI FM	TEAC CD-44E 4X ATAPI FM	None N/A FM, wavetable	TEAC CD-44E 4X ATAPI Wavetable	TEAC CD-44E 4X ATAPI FM	Toshiba XM-1302B 4X ATAPI FM
PC Card Shared port Two Type II or one Type III	PC Card Shared port Two Type II or one Type III	PC Card Shared port Two Type II or one Type III	PC Card Shared port Two Type II or one Type III	PC Card Shared port Two Type II or one Type III	PC Card Shared port Two Type II or one Type III	PC Card Shared port One Type II and one Type III	Integrated Shared port Two Type II or one Type III	PC Card Shared port Two Type II or one Type III	PC Card Shared port Two Type II or one Type III
Touch pad	Touch pad	Touch pad	Pointing stick	Pointing stick	Pointing stick	Pointing stick	Pointing stick	Touch pad	Touch pad
Lithium ion 3:00, 2:30	Lithium ion 3:00, 1:00	Nickel hydride 3:50, 2:00	Lithium ion 5:30, 4:00	Lithium ion 5:30, 4:00	Nickel hydride 1:30, 1:15	Lithium ion 2:30, 1:30	Lithium ion 3:00, 2:30	Lithium ion 2:00, 2:00	Nickel hydride 2:00, 1:00
1 year/1 year N/A	1 year/1 year N/A	1 years/1 year \$495.00	1 year/1 year N/A	3 years/3 years N/A	1 year/1 year N/A	1 year/1 year N/A	3 years/3 years N/A	1 year/1 year N/A	4 years/4 years Included (4 years)

to guide your project down a clear path

Microsoft Project for Windows 95.

Now you can manage projects more simply, more smoothly, by communicating project information as it occurs. With Microsoft® Project you can convey project status quickly and effectively so your boss, customers, and coworkers are always in the loop. From sharing task deadlines and responsibilities, to letting people know about changes and the impact they'll have on the deadline, you have the tools to organize your projects into manageable steps and keep them moving in the right direction. Microsoft Project unlocks the doors of communication and gives you the power to navigate the most efficient route to a successful end product.



Graphical views let teammates visualize where the project is going.

With Microsoft Project you can display project data in ways that everyone can understand. Great-looking Gantt Charts integrate text, timelines and graphical bars so everyone can see start and finish dates, interdependencies and task assignments. Throughout your project, you can also use a Monthly Calendar report to share your plan in a format that's clear and easy to read. And since Microsoft Project shares many of the same key commands with other Office applications, it will be easy to create schedules and reports. But if at any time you need help, type in a question and the Answer Wizard gives you the information you need. Microsoft Project helps you illustrate every phase of your project so you and your team keep your goals in sight.



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Keep everyone moving on the same track with open lines of communication.

Microsoft Project is completely integrated with a wide range of e-mail systems* and Schedule+ so that with a single click, changes and additions are immediately distributed to and from teammates. Assignments, task changes, and progress can be communicated and updated without ever reentering information, so you save time and eliminate mistakes. And because Microsoft Project is a member of the Office family, sharing data between programs is easy. For example, you can start building a schedule by simply dragging a task list out of Microsoft Excel and dropping it directly into your Microsoft Project plan. You keep communication clear and information consistent and your project continues to move exactly the way you planned.



 Start



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SUMMARY OF FEATURES

Color Pentium Notebooks



■ YES ■ NO

Products listed in alphabetical order

	MaxTech YesBook Model X753	Micro Express NP8000-P120	Micro Express NP8600-P120	Micron Millennia TransPort	NEC Versa 4000C	NEC Versa 4080H	Olivetti Echos P100D	Olivetti Echos P133S
Category	High-end value	Low-end value	Presentation	Presentation	High-end value	Presentation	Low-end value	High-end value
Price (tested configuration)	\$2,899 (street)	\$2,598 (direct)	\$2,999 (direct)	\$5,198 (direct)	\$4,490 (street)	\$4,790 (street)	\$2,499 (street)	\$4,999 (street)
System weight/Travel weight (pounds)	7.7, 8.7	6.7, 7.6	7.9, 9.0	7.5, 8.3	7.0, 7.7	6.6, 7.4	6.3, 7.5	6.7, 7.9
Dimensions (HWD, in inches)	2.3 x 11.8 x 9.0	2.0 x 11.3 x 8.8	2.3 x 11.8 x 9.0	2.1 x 11.8 x 9.3	2.3 x 11.8 x 9.5	2.3 x 11.8 x 9.5	2.0 x 11.3 x 8.9	2.0 x 11.3 x 8.9
Motherboard Components								
Processor type and speed	Pentium/120	Pentium/120	Pentium/120	Pentium/133	Pentium/75	Pentium/120	Pentium/100	Pentium/133
Installed/maximum system RAM	16MB EDO, 40MB	16MB EDO, 40MB	16MB, 40MB	16MB EDO, 48MB	16MB, 40MB	16MB, 40MB	16MB, 40MB	16MB, 40MB
Installed external RAM cache and type	256K pipelined-burst	256K synchronous	256K synchronous	256K pipelined-burst	256K pipelined-burst	256K pipelined-burst	N/A	256K asynchronous
Motherboard manufacturer	GVC	Chaplet	NTC	Sanyo	NEC	NEC	Chaplet	Chaplet
Chip set manufacturer and model	OPTi Viper	UMC 8891, 8892	UMC 8891, 8892	Intel 82430MX	Pico Power Golden Gate	Pico Power Golden Gate	UMC 8890	UMC 8890
BIOS manufacturer and version (or date)	Phoenix 4.04	Phoenix 4.04	SystemSoft 1.20	Phoenix 4.05	Phoenix 4.0	Phoenix 4.0	Phoenix 4.04	Phoenix 4.04
Flash BIOS/Plug and Play BIOS	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Display								
LCD-panel specifications	11.3" active-matrix SVGA	10.4" dual-scan VGA	10.4" active-matrix SVGA	12.1" active-matrix SVGA	10.2" active-matrix VGA	10.4" active-matrix SVGA	10.4" dual-scan SVGA	11.8" active-matrix SVGA
Graphics chip set manufacturer and model	Cirrus Logic CL-GD7543	C&T 65550	C&T 65548	Cirrus Logic CL-GD7548	C&T 65545	C&T 65545	C&T 65548	C&T 65548
Graphics RAM and type	1MB DRAM	1MB DRAM	1MB DRAM	1MB EDO DRAM	1MB DRAM	1MB DRAM	1MB DRAM	1MB DRAM
Resolutions and noninterlaced refresh rates supported on external display	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 70 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 72 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 72 Hz
Virtual desktop	■	■	■	■	■	■	■	■
Mass Storage								
Hard disk manufacturer and model	Toshiba MK2720FC	Quantum Europa 810AT	Toshiba MK2720FC	Toshiba MK2720FC	Toshiba MK1926FCV	IBM DSOA-21080	Toshiba MK1926FCV	Toshiba MK2720FC
Installed/maximum hard disk capacity	1.3GB, 1.3GB	778MB, 1.3GB	1.3GB, 1.3GB	1.3GB, 1.3GB	776MB, 1GB	1GB, 1GB	776MB, 1GB	1.3GB, 1.3GB
Floppy disk drive	Internal	Swappable	Swappable	Swappable	Swappable	Swappable	Swappable	Swappable
Multimedia Features								
CD-ROM manufacturer and model	TEAC CD-44E	TEAC CD-44E	Toshiba XM-1302B	Sanyo CRD-S56PMC	TEAC CD-44E	TEAC CD-44E	None	TEAC CD-44E
CD-ROM speed and interface	4X ATAPI	4X ATAPI	4X ATAPI	6X ATAPI	4X ATAPI	4X ATAPI	N/A	4X ATAPI
Sound synthesis	FM	FM, wavetable	FM, wavetable	FM	FM	FM	FM	FM
Built-in speakers	■	■	■	■	■	■	■	■
Line-in/line-out jacks	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Microphone/speaker jacks	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
NTSC video in/out	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Communications and Expansion								
Type of modem	PC Card	PC Card	PC Card	PC Card	PC Card	PC Card	PC Card	PC Card
Infrared interface	■	■	■	■	■	■	■	■
External keyboard and mouse ports	Shared port	Shared port	Shared port	Both	Shared port	Shared port	Shared port	Shared port
16550 UART/ECP/EPP support	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
PC Card slots	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	One Type II or one Type III	Two Type II or one Type III
Input Devices								
Full-size alphanumeric/cursor keys	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Type of integrated pointing device	Touch pad	Touch pad	Touch pad	Touch pad	Touch pad	Touch pad	Touch pad	Touch pad
Power								
Battery type	Nickel hydride	Nickel hydride	Nickel hydride	Lithium ion	Lithium ion	Lithium ion	Nickel hydride	Nickel hydride
Rated charge time while on/off (hours:minutes)	3:30, 1:30	2:00, 2:00	2:00, 2:00	5:00, 2:30	2:30, 2:30	2:30, 2:30	4:00, 3:00	4:00, 3:00
Standby/hibernation mode	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Battery hot-swapping/Smart battery	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Service and Support								
Standard warranty on parts/labor	1 year/1 year	2 years/2 years	2 years/2 years	3 years/3 years	3 years/3 years	3 years/3 years	1 year/1 year	1 year/1 year
On-site service charge (first year)	N/A	N/A	N/A	N/A	Included	Included	N/A	N/A
24-hour, 7-day live technical support	■	■	■	■	■	■	■	■

N/A—Not applicable. The product does not have this feature.

Continues

Polywell Poly 500N85	Samsung SENS 810 (P-100)	Samsung SENS 810 (P-133)	TI Extensa 515	TI Extensa 570CDT	Toshiba Satellite Pro 420CDT	Toshiba Tecra 720CDT	Twinhead Slimnote 875CX	Twinhead Slimnote 8100TX	Twinhead Slimnote H120TV
High-end value \$3,300 (street) 7.9, 9.0 2.3 x 11.9 x 9.0	Low-end value \$3,667 (street) 8.7, 9.6 2.3 x 11.5 x 9.5	Presentation \$4,499 (street) 8.7, 9.6 2.3 x 11.5 x 9.5	Low-end value \$2,299 (street) 5.9, 6.6 2.0 x 11.7 x 8.3	High-end value \$3,999 (street) 7.4, 8.5 2.5 x 11.5 x 8.8	High-end value \$4,198 (street) 7.5, 8.6 2.1 x 11.9 x 9.3	Presentation \$6,299 (street) 8.2, 10.3 2.5 x 11.8 x 9.1	Low-end value \$2,965 (street) 7.4, 8.3 2.0 x 11.5 x 8.0	High-end value \$3,775 (street) 7.3, 8.2 2.0 x 11.5 x 8.0	Presentation \$4,195 (street) 7.2, 8.1 2.0 x 11.5 x 8.8
Pentium/133 16MB, 32MB 256K asynchronous Kapak UMC 8890 SystemSoft 1.01	Pentium/100 16MB EDO, 40MB 256K pipelined-burst Samsung Intel 82430MX Phoenix 4.0	Pentium/133 16MB EDO, 40MB 256K pipelined-burst Samsung Intel 82430MX Phoenix 4.0	Pentium/100 16MB EDO, 40MB N/A Acer ALI ALI-2 Acer 2.0	Pentium/100 16MB, 40MB 256K synchronous First International Computer OPTi Viper Phoenix 4.0	Pentium/100 16MB EDO, 40MB N/A Toshiba Toshiba Toshiba 5.11	Pentium/133 16MB EDO, 144MB 256K pipelined-burst Toshiba Toshiba Toshiba 5.10	Pentium/75 16MB, 64MB 256K synchronous Twinhead SiS 550 Phoenix 4.04	Pentium/100 16MB, 64MB 256K synchronous Twinhead SiS 550 Phoenix 4.04	Pentium/120 16MB, 64MB 256K synchronous Twinhead SiS 550 Phoenix 4.04
10.4" active-matrix SVGA Cirrus Logic CL-GD7543 2MB VRAM 800 x 600 at 75 Hz, 1,024 x 768 at 72 Hz	11.4" dual-scan SVGA Cirrus Logic CL-GD7543 1MB VRAM 800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	11.4" active-matrix SVGA Cirrus Logic CL-GD7543 1MB VRAM 800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	10.4" dual-scan VGA C&T 65545 1MB DRAM 800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	10.3" active-matrix SVGA Cirrus Logic CL-GD7543 1MB DRAM 800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	11.5" active-matrix SVGA C&T 65550 2MB EDO DRAM 800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz	12.1" active-matrix XGA C&T 65550 2MB EDO DRAM 800 x 600 at 75 Hz, 1,024 x 768 at 72 Hz	10.4" dual-scan SVGA Cirrus Logic CL-GD7543 1MB DRAM 800 x 600 at 72 Hz, 1,024 x 768 at 70 Hz	10.4" active-matrix SVGA Cirrus Logic CL-GD7543 1MB DRAM 800 x 600 at 75 Hz, 1,024 x 768 at 72 Hz	11.3" active-matrix SVGA Cirrus Logic CL-GD7543 1MB DRAM 800 x 600 at 72 Hz, 1,024 x 768 at 72 Hz
Hitachi DK212A-10 1GB, 1.3GB Swappable	IBM DPRA-20810 773MB, 1.3GB Swappable	Toshiba MK2720FC 1.3GB, 1.3GB Swappable	IBM DSOA-20810 774MB, 810MB Internal	IBM DPRA-21215 1.1GB, 1.2GB Swappable	Toshiba MK1926FCV 776MB, 1.3GB External	Toshiba MK2720FC 1.3GB, 1.6GB Swappable	Seagate ST9816AG 772MB, 810MB Swappable	Seagate ST9816AG 772MB, 1.3GB Swappable	Toshiba MK2720FC 1.3GB, 1.3GB Swappable
TEAC CD-44E 4X ATAPI FM	Toshiba XM-1302B 4X ATAPI FM	Toshiba XM-1302B 4X ATAPI FM, wavetable	None N/A FM	Matsushita UJDCD4722 4X ATAPI FM	Toshiba XM-1402B 6X ATAPI FM	Toshiba XM-1402B 6X ATAPI FM, wavetable	Matsushita UJDCD4731 4X ATAPI FM	Matsushita UJDCD4731 4X ATAPI FM	Matsushita UJDCD4731 4X ATAPI FM
PC Card Shared port Two Type II or one Type III	Integrated Shared port Two Type II or one Type III	Integrated Shared port Two Type II or one Type III	PC Card Shared port Two Type II or one Type III	PC Card Shared port Two Type II or one Type III	PC Card Shared port Two Type II or one Type III	Integrated Shared port Two Type II or one Type III	PC Card Shared port Two Type II or one Type III	PC Card Shared port Two Type II or one Type III	PC Card Shared port Two Type II or one Type III
Touch pad	Touch pad	Touch pad	Touch pad	Touch pad	Pointing stick	Pointing stick	Touch pad	Touch pad	Touch pad
Nickel hydride 3:20, 2:10	Nickel hydride 3:00, 1:50	Nickel hydride 3:00, 1:50	Nickel hydride 7:00, 2:00	Nickel hydride 3:00, 2:00	Lithium ion 8:00, 3:00	Lithium ion 10:00, 4:00	Lithium ion 8:00, 2:00	Lithium ion 8:00, 2:00	Lithium ion 8:00, 2:00
1 year/1 year N/A	3 years/3 years N/A	3 years/3 years N/A	1 year/1 year N/A	1 year/1 year N/A	3 years/3 years \$49.95	3 years/3 years \$49.95	1 year/1 year N/A	1 year/1 year N/A	1 year/1 year N/A

SUMMARY OF FEATURES

Ends

Color Pentium Notebooks



■ YES ■ NO

Products listed in alphabetical order

	Unisys Aquanta MN	WinBook XP5 P100	WinBook XP5 P120	WinBook FX
Category	High-end value	Low-end value	High-end value	Presentation
Price (tested configuration)	\$4,694 (list)	\$2,599 (direct)	\$3,679 (direct)	\$4,079 (direct)
System weight/Travel weight (pounds)	7.0, 7.7	6.3, 7.1	5.9, 6.7	7.6, 8.3
Dimensions (HWD, in inches)	2.0 x 11.8 x 9.0	2.0 x 11.4 x 8.8	2.0 x 11.4 x 8.8	2.3 x 11.3 x 9.0
Motherboard Components				
Processor type and speed	Pentium/120	Pentium/100	Pentium/120	Pentium/133
Installed/maximum system RAM	16MB, 40MB	16MB, 32MB	16MB, 32MB	16MB EDO, 40MB
Installed external RAM cache and type	256K synchronous	256K synchronous	256K synchronous	256K pipelined-burst
Motherboard manufacturer	Acer	ASE Technology	ASE Technology	Quanta
Chip set manufacturer and model	ALI M1451C	ACC Micro 2057	ACC Micro 2057	Intel 82430MX
BIOS manufacturer and version (or date)	Phoenix 4.0	Phoenix 1.03	Phoenix 1.03	Phoenix 4.0
Flash BIOS/Plug and Play BIOS	■ ■	■ ■	■ ■	■ ■
Display				
LCD-panel specifications	10.5" active-matrix SVGA	10.4" dual-scan VGA	11.4" active-matrix SVGA	11.3" active-matrix SVGA
Graphics chip set manufacturer and model	C&T 65550	C&T 65535	C&T 65548	Cirrus Logic CL-GD7543
Graphics RAM and type	1MB DRAM	1MB DRAM	1MB DRAM	1MB DRAM
Resolutions and noninterlaced refresh rates supported on external display	800 x 600 at 75 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz
Virtual desktop	■	■	■	■
Mass Storage				
Hard disk manufacturer and model	IBM DPRA-21215	Toshiba MK1926FCV	Toshiba MK2720FC	Toshiba MK2720FC
Installed/maximum hard disk capacity	1.1GB, 1.3GB	776MB, 1.3GB	1.3GB, 1.3GB	1.3GB, 1.3GB
Floppy disk drive	Swappable	Internal	Internal	Swappable
Multimedia Features				
CD-ROM manufacturer and model	TEAC CD-44E	None	None	TEAC CD-44E
CD-ROM speed and interface	4X ATAPI	N/A	N/A	4X ATAPI
Sound synthesis	FM	FM	FM	FM
Built-in speakers	■	■	■	■
Line-in/line-out jacks	■ ■	■ ■	■ ■	■ ■
Microphone/speaker jacks	■ ■	■ ■	■ ■	■ ■
NTSC video in/out	■ ■	■ ■	■ ■	■ ■
Communications and Expansion				
Type of modem	PC Card	Integrated	Integrated	PC Card
Infrared interface	■	■	■	■
External keyboard and mouse ports	Shared port	Shared port	Shared port	Shared port
16550 UART/ECP/EPP support	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
PC Card slots	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	One Type II/III and one Type II
Input Devices				
Full-size alphanumeric/cursor keys	■ ■	■ ■	■ ■	■ ■
Type of integrated pointing device	Touch pad	Pointing stick	Pointing stick	Pointing stick and touch pad
Power				
Battery type	Lithium ion	Lithium ion	Lithium ion	Lithium ion
Rated charge time while on/off (hours:minutes)	2:00, 2:00	4:00, 2:00	4:00, 2:00	6:00, 4:00
Standby/hibernation mode	■ ■	■ ■	■ ■	■ ■
Battery hot-swapping/Smart battery	■ ■	■ ■	■ ■	■ ■
Service and Support				
Standard warranty on parts/labor	3 years/3 years	1 year/1 year	1 year/1 year	1 year/1 year
On-site service charge (first year)	N/A	N/A	N/A	N/A
24-hour, 7-day live technical support	■	■	■	■

N/A—Not applicable: The product does not have this feature.

drive, a fixed floppy disk drive, 16-bit audio with two speakers, a touch pad, and a keyboard with two Windows 95-specific keys.

In addition to standard I/O ports, the unit has an IrDA infrared port, an NTSC- and PAL-compatible video-out port, and a docking station connector. The unit's PC Card slot can hold either two Type II PC Cards or one Type III card. The system also came with a standard 28.8/14.4-Kbps PC Card fax modem.

Within its presentation class, the Z-Optima performed well, earning average scores across our tests. Using a nickel hydride battery, the system lasted 1:47 on our BatteryMark test. The Z-Optima's travel weight is 9 pounds.

Hertz covers the unit with a one-year parts-and-labor warranty. On-site service is \$495 for one year.—RSA

Hertz Z-Optima NB P150c. Direct price: \$3,995. Hertz Computer Corp., New York, NY; 800-232-8737, 212-684-4141; fax, 212-684-3658. *Circle 515 on reader service card.*

Hewlett-Packard Co.

OmniBook 5500 CS, OmniBook 5500 CT

Hewlett-Packard Co.'s OmniBook 5500 CT presentation notebook (\$6,120 street) and OmniBook 5500 CS (\$3,700 street) low-end value machine are well-built notebooks with plenty of features, including an NTSC-compatible S-Video-out connector. HP has designed the units with corporate sales force automation in mind; each kept pace with its respective competition on our benchmark tests.

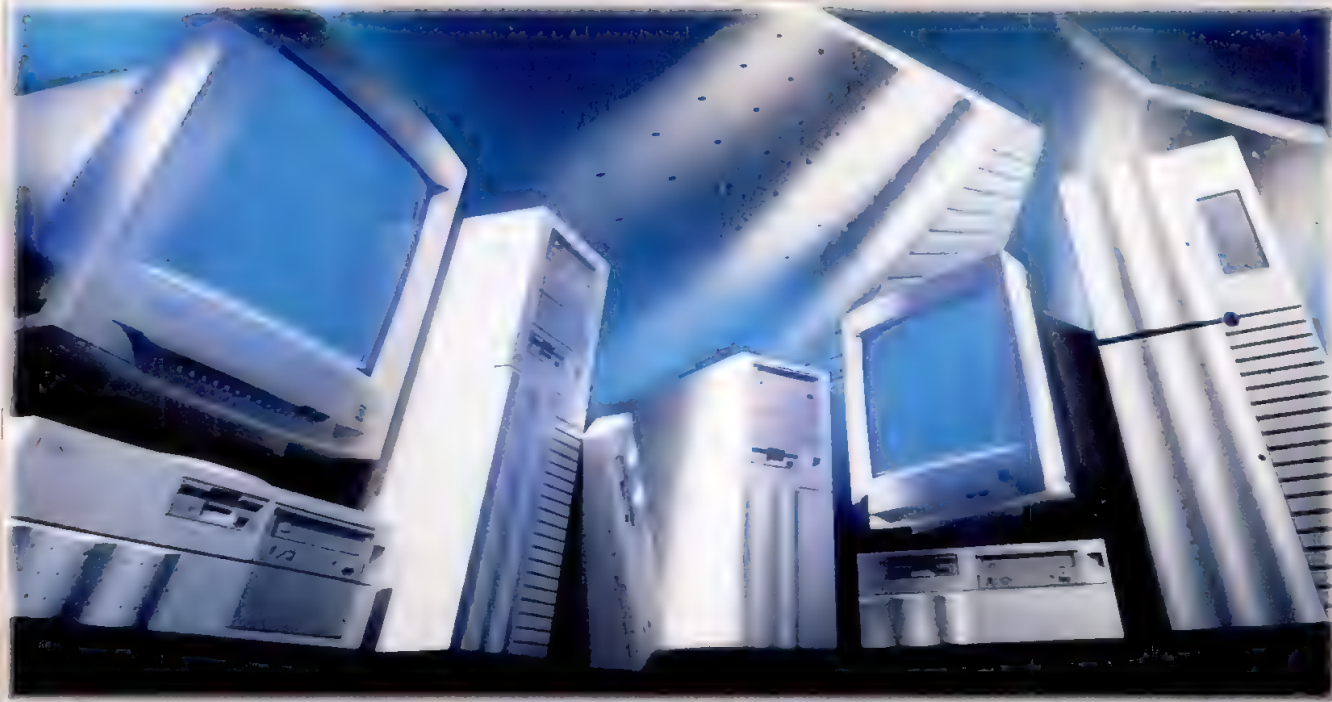
The 5500 CT is a Pentium/133-based system with a 12.1-inch active-matrix SVGA screen. The 100-MHz 5500 CS has an 11.4-inch dual-scan SVGA panel. Both OmniBooks use Chips and Technologies' 65548 graphics chip set with 1MB of DRAM, which enables the display driver to create a virtual desktop with external resolutions up to 1,280-by-1,024.

Weighing in at 8 pounds (travel

SERVICE & RELIABILITY

Hewlett-Packard Co.

Reliability	Average
Repair	Better than average
Technical support	Better than average
Percent needing repair	Average



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UNISYS

The Information Management Company

weight), the two OmniBooks are well equipped, with 256K of pipelined-burst L2 cache, two Type II PC Card slots, a pointing stick, the usual array of ports plus a MIDI/game port, and 16-bit sound, with built-in speakers at the wrist rest. The 5500 CT came with a 1.3GB Toshiba MK2720FC hard disk, and the 5500 CS used a 776MB MK1926FCV Toshiba disk. We also received a 28.8/14.4-Kbps PC Card fax modem (included in the above price), but they must be purchased from a third party; they are not available from HP. A single modular slot in the front of the unit can accommodate an internal floppy disk drive, 4X CD-ROM drive, or second battery. The floppy disk module can also be attached to the parallel port to function as an external drive.

The two units performed well within their classes, garnering mostly average scores. Exceptions included an above-average Graphics WinMark 96 result for the 133-MHz unit and the 100-MHz model's above-average scores on both CPUmark measures and our CD-ROM WinMark 96 tests, as well as its below-average Disk WinMark 96 score. Using lithium ion batteries, the 5500 CS and the 5500 CT lasted 2:49 and 2:26, respectively, on our BatteryMark test.

The 5500 CT is protected by a three-year warranty, and the 5500 CS is covered for one year.—CL

OmniBook 5500 CT. Street price: \$6,120. **OmniBook 5500 CS.** Street price: \$3,700. Hewlett-Packard Co., Palo Alto, CA; 800-443-1254, 541-715-2000; <http://www.hp.com>. Circle 516 on reader service card.

IBM Personal Computer Co.

ThinkPad 560, ThinkPad 760ED, ThinkPad 365XD



In recent years we've come to expect IBM Personal Computer Co. to impress us with innovative notebooks. As a group, the \$3,699 high-end value ThinkPad 365XD, the \$3,749 lightweight ThinkPad 560, and the \$6,999 presentation-class ThinkPad 760ED do not disappoint, each offering solid design and a good feature set. Both the 560 and the 760ED are Editors' Choices in this roundup. Moreover, the 133-MHz 760ED truly excelled on our tests; its fellow ThinkPads turned in mostly average performance.

The 8.1-pound (travel weight) 760ED is an all-out muscle machine with as many features as IBM could squeeze in. It offers a 1.2GB hard disk, front and rear infrared ports, a keyboard that tilts up when the unit is opened, NTSC video-in and video-out ports, a digital LCD battery gauge, and a game/MIDI port. The unit also features an IBM Media Processor, which acts as a 28.8/14.4-Kbps data/fax modem and provides audio and telephony features. Its 12.1-inch SVGA TFT black-matrix screen is powered by a 64-bit Trident 9385 graphics chip set with 2MB of VRAM. The 4X CD-ROM module can be swapped for a floppy disk drive module, or the unit can be used with a separate external floppy disk drive.

The 760ED's benchmark scores were simply stunning. It posted the best Winstone 96, Winstone 32, Disk WinMark 96, and Graphics WinMark 96 scores in this roundup. Its CD-ROM WinMark 96 score was average. Despite its power, the unit, which uses a lithium ion battery, posted a highly impressive BatteryMark time of 2:53.

The focus of the 120-MHz 560 is portability, not performance: It is just an inch and a quarter thick and lasted 3:38 on our BatteryMark test—one of the best times in this roundup—yet offers a dazzling 12.1-inch SVGA active-matrix display and a full-size keyboard. Its travel weight is just 4.8 pounds, a figure aided by a very compact AC adapter brick. The unit also came with a 774MB hard disk, an infrared port, and an expansion port (for a docking station or a port replicator) and uses an 11-ounce external floppy disk drive. Its performance is competitive: Its Winstone score was below average for its class, but all other scores were average. The 560 replaces the ThinkPad 701C “butterfly,” whose folding keyboard no longer makes sense with a larger screen.

Targeted at the mainstream business market, the 7.2-pound (travel weight), 120-MHz 365XD features a 10.4-inch active-matrix screen and a 1GB hard disk. It also features the familiar ThinkPad flip-up keyboard and TrackPoint III pointing device, and it uses a fixed 4X CD-ROM drive and an external floppy disk drive. It also offers a built-in 16-bit audio system, a single speaker, and an IrDA infrared port. The 365XD posted average scores on all benchmark tests, and using a nickel hydride battery, it ran for 2:20 on our BatteryMark test.

IBM offers a one-year warranty on the 365XD and the 560 and covers the 760ED for three years; 24-hour, 7-day technical support is also available for all three units.—RSA

ThinkPad 560. Street price: \$3,749. **ThinkPad 760ED.** Street price: \$6,999. **ThinkPad 365XD.** Street price: \$3,699. IBM Personal Computer Co., Somers, NY; 800-772-2227, 914-766-1900; fax, 800-426-4329; <http://www.pc.ibm.com>. Circle 517 on reader service card.

SERVICE & RELIABILITY

IBM Personal Computer Co.	
Reliability	Better than average
Repair	Better than average
Technical support	Better than average
Percent needing repair	Average



HP 5500 CT, IBM 560.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
HP OmniBook 5500 CS	Good	Good
HP OmniBook 5500 CT	Good	Good
IBM ThinkPad 560	Fair	Excellent
IBM ThinkPad 760ED	Excellent	Excellent
IBM ThinkPad 365XD	Good	Good

Keydata International Inc.

Keynote GT

Keydata's Keynote GT notebook (\$3,795 direct) is an average performer with an attractive array of features and options. Aimed at corporate users, this high-end value notebook (8 pounds travel weight) comes with a Pentium/120 CPU, 256K of asynchronous L2 cache, and an eye-catching 12-inch active-matrix SVGA display. Keydata is returning to the direct consumer PC market after a three-year absence, during which it focused on government contracts.

The Keynote came equipped with a 1.3GB Toshiba hard disk, two Type II (or one Type III) PC Card slots, 16-bit sound, and a 28.8/14.4-Kbps V.34 PC Card fax modem. The unit's stereo speakers are embedded in the wrist rest, along with a touch pad. The system has all standard ports, as well as audio in/out and a 115.2-Kbps infrared port. The Keynote also comes with a carrying case and a car adapter (an \$88 option, included in the price quoted above).

The unit's internal floppy disk drive can be replaced by a 4X CD-ROM drive, a second lithium battery, or a second hard disk. Options include a port replicator (\$140); according to Keydata, a full-size docking station with expansion slots will be available by the time you read this.

The system was a fairly good performer on our tests. Its scores were average except for a below-average result on our Disk WinMark 96 tests. In our BatteryMark test, the unit's battery lasted 1:59.

The Keynote GT comes with a one-year parts-and-labor warranty.—CL

Keynote GT. Direct price: \$3,795. Keydata International Inc., South Plainfield, NJ; 800-486-4800, 908-755-0350; fax, 908-756-7359; keysales@ix.netcom.com. *Circle 518 on reader service card.*

Maximus Computers Inc.

MediaNote CD Book

Maximus Computers' 133-MHz Pentium MediaNote CD Book (\$3,795 direct price) will get the job done for its intended market of business users. This high-end value portable boasts such features as a 12.1-inch SVGA active-matrix display, plus a four-year warranty.

It was a mostly average performer on our benchmark tests.

This notebook has some well-thought-out design features, including its combination quad-speed CD-ROM drive and floppy disk drive—a great use of space, and a feature that's unique to this machine. The wrist rest contains speakers and a microphone, and the removable keyboard allows easy access to the processor and memory for future upgrades. On the downside, the MediaNote's case leaves input/output ports exposed at all times, and a plastic panel on the hard disk houses the speaker volume control and audio jack, making hard-disk swaps difficult.



Keydata, Maximus, MaxTech.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
Keydata Keynote GT	Good	Good
Maximus MediaNote CD Book	Good	Good
MaxTech YesBook Model X753	Good	Good

The MediaNote (with a travel weight of 8.9 pounds) also includes a 1.3GB Toshiba hard disk, two stacked Type II PC Card slots, a touch pad, and a 28.8/14.4-Kbps PC Card V.34 fax modem.

The MediaNote performed fairly well on our benchmark tests. It garnered mostly average results, with three exceptions: Both CPUmark scores and the system's Winstone 32 score were below average. Using a nickel hydride battery, the unit lasted 2 hours on our BatteryMark tests.

The MediaNote's four-year warranty includes on-site service.—CL

MediaNote CD Book. Direct price: \$3,795. Maximus Computers Inc., Monrovia, CA; 800-888-6294, 818-305-5925; fax, 818-357-9140; <http://www.maximuspc.com>. *Circle 519 on reader service card.*

MaxTech Corp.

YesBook Model X753

If you're looking for a bargain-priced high-end machine, consider MaxTech's YesBook Model X753, which sells at a surprisingly low \$2,899 street price. This 120-MHz Pentium unit has an 11.3-inch SVGA Mitsubishi active-matrix display, a 1.3GB Toshiba hard disk, a TEAC 4X CD-ROM drive, and even a composite NTSC video-out port, so it can double as a presentation machine. The YesBook performed well on most of our benchmark tests.

MaxTech's price is especially surprising given that Ergo and Hertz sell the same notebook, with comparable components, at significantly higher prices: \$4,195 and \$3,995, respectively. Both versions are reviewed in this roundup. (GVC Corp. manufactures the notebook.)

Loaded with 256K of pipelined-burst L2 cache, the YesBook posted above-average scores on our CPUmark tests. Other test scores were average for its high-end value

class except for a below-average result on our Graphics WinMark 96 tests. Using a nickel hydride battery, the YesBook managed a 1:45 result on our BatteryMark tests.

The tested system also came with 1MB DRAM to support the Cirrus Logic 7543 graphics chip set. (MaxTech will upgrade this to 2MB, for the same price, by the time you read this review.) The YesBook has an 8.7-pound travel weight.

MaxTech sells the system with a one-year parts-and-labor warranty. Since dealers also sell the YesBook, other terms are likely to be available.—BB

YesBook Model X753. Street price: \$2,899. MaxTech Corp., Cerritos, CA; 800-936-7629, 310-921-1698; fax, 310-802-9605; <http://www.maxcorp.com>; info@maxcorp.com. *Circle 520 on reader service card.*

Micro Express

**Micro Express NP8000-P120,
Micro Express NP8600-P120**

If you need a high-powered notebook but don't have a large budget, look to Micro Express for good deals on two 120-MHz Pentium-based portables. The low-end value, 7.6-pound Micro Express NP8000-P120 costs \$2,598 (direct) and has a 10.4-inch dual-scan VGA screen, a 4X CD-ROM drive, and a 778MB hard disk; Micro Express intends it for both business and home users. The 9-pound Micro Express NP8600-P120 costs \$2,999 (direct) and has a 10.4-inch active-matrix screen, a fixed 4X CD-ROM drive, a floppy disk drive, and a 1.3GB hard disk; it is a presentation-class system meant as a desktop replacement. Both systems were competitive performers on our tests.

The NP8000, manufactured by Chaplet Systems USA, is similar to the Olivetti Echos P100D (reviewed elsewhere in this roundup). The NP8000 fared well in testing in the 120-MHz group, with average scores across our benchmark tests. The unit's nickel hydride battery powered it for 1:12 on the BatteryMark test. For extended use, you can install a second battery in the system's modular port. (This port can also house either the floppy disk drive or the CD-ROM drive; the floppy disk drive can also be used externally.) The unit is available without the CD-ROM module for \$2,299.

The NP8600 is similar to the BSI NP8662T and the DTK DTN-5P120C units (also reviewed in this roundup) and is manufactured by NTC. The NP8600 posted average scores on most tests but garnered below-average results on both CPUmark tests. On our BatteryMark test, this notebook lasted for 1:20.

The Micro Express notebooks both use UMC chip sets, 256K synchronous L2 cache, standard DRAM, and sound chips capable of FM and wavetable synthesis. The notebooks are sold with a two-year warranty. Live toll-free technical support is available 24 hours a day, 7 days a week.—BB

Micro Express NP8000-P120. Direct price: \$2,598. **Micro Express NP8600-P120.** Direct



Micro Express NP8600, NEC 4080H, Micron TransPort.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
Micro Express NP8000-P120	Good	Fair
Micro Express NP8600-P120	Good	Good
Micron Millennium TransPort	Excellent	Excellent
NEC Versa 4000C	Good	Fair
NEC Versa 4080H	Good	Good

price: \$2,999. Micro Express, Irvine, CA; 800-989-9900, 714-852-1400; fax, 714-852-1225; <http://www.wpages.com/microexpress>. Circle 521 on reader service card.

Micron Electronics Inc.

Millennia TransPort

Packed with features and backed by a good warranty, the Editors' Choice-winning, presentation-class Millennium TransPort is a great candidate for those who want no compromises. Positioned as a high-end desktop replacement system, it makes a highly impressive first outing for Micron, which is well known in the desktop market but very new to portables. At \$5,198 (direct price), the 133-MHz system comes with impressive components, including a 12.1-inch active-matrix SVGA Toshiba display, a Toshiba 1.2GB hard disk, a Sanyo 6X CD-ROM drive, and both NTSC and S-Video video-out ports.

Based on an Intel mobile Triton chip set, the 8.2-pound (travel weight) system has 256K of pipelined-burst L2 cache and EDO DRAM. These components helped it earn above-average scores on both Winstone, both CPUmark, and our Disk WinMark 96 tests. Its CD-ROM Win-

Mark 96 score was well above average. Its Graphics WinMark 96 score was average. The unit's lithium ion battery helped it last 2:41 on our BatteryMark test.

Micron also bundles Microsoft Office 95 Pro with the TransPort. The unit's standard floppy disk drive and CD-ROM drive are swappable, and you can replace them with a second battery (\$199) or 1.2GB hard disk. A \$299 Micron Dock Multimedia Port Replicator has a full set of ports, an

Ethernet adapter, a SCSI-2 port, and larger stereo speakers than on the notebook.

The system is covered for three years and its CPU and memory for five years. Toll-free technical support is available 24 hours a day, 7 days a week.—BB

Millennia TransPort. Direct price: \$5,198. Micron Electronics Inc., Nampa, ID; 800-486-2065, 208-893-8970; fax, 208-893-3424; <http://www.mei.micron.com>. Circle 522 on reader service card.

NEC Technologies Inc.

**Versa 4000C,
Versa 4080H**

NEC's Versa line of notebooks features handsome styling and a full complement of components to please the demanding road warrior. Built for the mainstream corporate market, the Versa 4080H (\$4,790 street price) is a presentation-class machine with a Pentium/120 CPU

but mostly below-average performance. The high-end value, 75-MHz Versa 4000C performed poorly for its category, and its \$4,490 street price is also more expensive than most Pentium/100 systems in this

SERVICE & RELIABILITY

NEC Technologies Inc.

Reliability	Better than average
Repair	Better than average
Technical support	Better than average
Percent needing repair	Average

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 **TEXAS
INSTRUMENTS**

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roundup. For those looking for more power, NEC offers the Versa 6000 series of notebooks (see "The Shape of Laptops to Come" for a discussion of their features). They are now available but were not ready in time for testing.

The two systems come with slightly different screens, 10.2 inches on the 4000C and 10.4 inches on the 4080H; both produce brilliant pictures at SVGA resolution. NEC has positioned the stereo speakers well on each unit, at the top corners of the display panel, and the wrist

*The NEC Versa
units feature brilliant
active-matrix screens
with 800-by-600 reso-
lution, as well as IrDA
infrared ports.*

rest contains a touch pad. Each unit's internal floppy disk drive is easily removable, and you can replace it with a 4X CD-ROM drive, with an additional hard disk, or with a second battery.

The 4080H comes with a 1GB hard disk; the 4000C's is 776MB. The Versa systems include two Type II PC Card slots, usable as one Type III slot, and a 28.8/14.4-Kbps PC Card fax modem. Other features include VGA, parallel, and serial ports; a PS/2-style keyboard/mouse connector; and IrDA-compliant 115.2-Kbps infrared I/O.

Both Versa systems use lithium ion battery packs. On our BatteryMark tests, these packs yielded 2:19 of life for the 4080H (7.4-pound travel weight) and 2:07 for the 4000C (7.7-pound travel weight). Other test results were not as good: The 4000C had below-average results across the board for its category, and the 4080H had below-average scores on our Winstone and CPUmark tests as well as on the CD-ROM WinMark 96 tests. The 4080H's other scores were average.

NEC Versa notebooks have a three-year parts-and-labor warranty.—CL

Versa 4000C. Street price: \$4,490. **Versa 4080H.** Street price: \$4,790. NEC Tech-

nologies Inc., Mountain View, CA; 800-388-8888, 508-264-8000; fax, 800-366-0476; <http://www.nec.com>; techsupport@necotech.com. Circle 523 on reader service card.

Olivetti Personal Computers

Echos P100D, Echos P133S

Olivetti Personal Computers' high-end value, 133-MHz Echos P133S (\$4,999 street), meant for mobile professionals, and the low-end value, 100-MHz Echos P100D (\$2,499 street), marketed as an entry-level machine, each combine rugged design and good features. But although the P133S performed well, the P100D could not keep up with its competition. We were disappointed with both units' tested battery life: The P100D lasted 1:21 and the P133S 1:11. (Both use nickel hydride batteries.)

Since our tests, Olivetti has upgraded the P100D, which is no longer available; its replacement (with the same price) is the P100C, which has an 11.3-inch screen, a 6X CD-ROM drive, and a 1.3GB hard disk. The Echos line marks Olivetti's reentry into the U.S. PC market; Echos have been available in Europe since August 1995.

The P100D is similar to the Micro Express NP8000-P120 (also in this roundup); Chaplet Systems USA builds both.

The 7.9-pound P133S comes with an 11.8-inch TFT screen, and the 7.5-pound P100D uses a 10.4-inch DSTN screen; both are SVGA displays. The P133S also includes 256K of L2 cache and a 1.3GB hard disk—almost twice the storage of the



Olivetti P133S.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
Olivetti Echos P100D	Fair	Fair
Olivetti Echos P133S	Good	Good

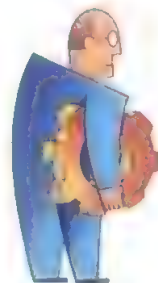
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P100D's 776MB disk. Both Echos have a touch pad, stereo speakers, and 115.2-Kbps infrared ports.

The Echos feature internal floppy disk drives that can double as external drives when you attach a cable to the parallel port. The machines also have one modular bay, which can house a second battery or a 4X CD-ROM drive. (Olivetti did not send a CD-ROM drive with the P100D.)

The P133S performed well, with an above-average Graphics WinMark 96 score and average scores on other tests. The P100D performed poorly: It posted below-average scores across all of our benchmark tests.

Echos notebooks have a one-year warranty. Toll-free technical support is available 24 hours a day, 7 days a week.—*CL*
Echos P133S. Street price: \$4,999. **Echos P100D.** Street price: \$2,499. Olivetti Personal Computers, Austin, TX; 888-465-4838, 512-310-2555; <http://www.olivetti.com>. Circle 524 on reader service card.

Polywell Computers Inc.

Poly 500NB5

While Polywell Computers' \$3,300 (street) 133-MHz Poly 500NB5 is heavy on multimedia and game features, it was a poor performer on most of our benchmark tests. Polywell markets the system as a high-end value unit for frequent multimedia software users. The 500NB5 is similar to Broadax Systems' NP5265A and Chem USA's Chem-Book 5400 TFT, 150-MHz units (both reviewed elsewhere in this issue). Polywell also markets the Poly 500NS, its top-of-the line laptop.

The 9-pound (travel weight) 500NB5 comes with a 10.4-inch TFT screen controlled by a Cirrus Logic 7543 chip set with 2MB of VRAM. The unit's 1GB Hitachi hard disk and its floppy disk drive slide out easily. (You can replace the latter with a second bat-

tery.) The 500NB5 also has a 4X CD-ROM drive, 16-bit audio, two speakers, and a microphone.

The unit offers a 28.8/14.4-Kbps PC Card fax modem, an IrDA-compliant infrared port, an expansion port for a mini-docking station, and rear contacts for a \$250 external battery pack. For gaming away from home, the 500NB5's palm rest offers a joystick rocker button, four joystick buttons, a touch pad, and a game/MIDI port.

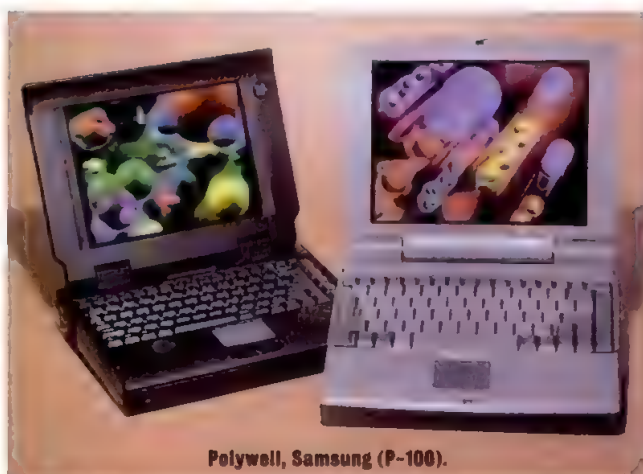
The 500NB5 logged some of the lowest scores in its class on our Winstone tests. Except for an average CD-ROM WinMark 96 score, other test results were all below average. On our BatteryMark test the system, which uses a nickel hydride battery, lasted 1:01. The unit has a one-year warranty.—*RSA*

Poly 500NB5. Street price: \$3,300. Polywell Computers Inc., South San Francisco, CA; 800-999-1278, 415-583-7222; fax, 415-583-1974; <http://www.polywell.com>. Circle 525 on reader service card.

Samsung Electronics America

SENS 810 (P-100), SENS 810 (P-133)

Samsung Electronics America's SENS 810 notebooks are represented here in two categories. The 100-MHz SENS 810 (P-100), a low-end value unit with a 773MB hard disk, a 4X CD-ROM drive, and an 11.4-inch dual-scan SVGA display



Polywell, Samsung (P-100).

SUITABILITY TO TASK

	Desktop replacement	Road warrior
Polywell Poly 500NB5	Fair	Fair
Samsung SENS 810 (P-100)	Good	Good
Samsung SENS 810 (P-133)	Excellent	Good

Things that are
inexpensive.



{Newspaper}



{Bug}



{NETGEAR™}

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(\$3,667 street), is a bit pricey for a business system without a TFT screen but is otherwise appealing. The \$4,499 (street) 133-MHz SENS 810 (P-133), a presentation system, comes with a 1.3GB hard disk, an 11.4-inch TFT display, and wavetable sound and offers a better balance of features and price. Both performed fairly well, although our technicians were not impressed by the build quality of either unit.

Each unit's keyboard can split apart and swing to the sides for more comfortable use, much like Microsoft's ergonomic desktop-PC keyboard. The systems (both 9.6 pounds, travel weight) have Samsung motherboards with Intel chip sets, 256K of pipelined-burst cache, and EDO DRAM. Both also have internal 28.8/14.4-Kbps modems and nickel hydride batteries.

The P-100 posted above-average scores on our Winstone 32, CPUmark, and Disk and CD-ROM WinMark 96 tests; its Winstone 96 score was average for its class. Only the Graphics WinMark 96 score was below average, because of the Cirrus Logic CL-GD7543 graphics chip set with 1MB VRAM. Life away from AC is limited: The unit had a 1:27 BatteryMark result.

The P-133 scored above average on the Winstone 32 and CD-ROM WinMark tests and had the highest CPUmark results in this roundup. The unit's Winstone 96 score was average, but like the P-100, which has the same chip set, the P-133's Graphics WinMark 96 score was below average. Its Disk WinMark score was also below average. Its tested battery life was 2:47.

Samsung's three-year warranty includes 24-hour turnaround and toll-free technical support 24 hours a day, 7 days a week.—**BB SENS 810 (P-100).** Street price: \$3,667. **SENS 810 (P-133).** Street price: \$4,499. Samsung Electronics America, Ridgefield Park, NJ; 800-933-4110, 201-229-4000; fax, 800-229-2239; <http://www.sosimple.com>. *Circle 526 on reader service card.*

Texas Instruments Inc.

Extensa 515, Extensa 570CDT

Texas Instruments' Extensa notebooks offer good looks and functionality for small-office or home-office users. The 8.5-pound TI Extensa 570CDT (\$3,999 street)

SERVICE & RELIABILITY Texas Instruments Inc.

Reliability	Average
Repair	Average
Technical support	Average
Percent needing repair	Worse than average



TI 570CDT, Toshiba Tecra (with docking station).

SUITABILITY TO TASK

	Desktop replacement	Road warrior
TI Extensa 515	Poor	Fair
TI Extensa 570CDT	Good	Good
Toshiba Satellite Pro 420CDT	Excellent	Excellent
Toshiba Tecra 720CDT	Excellent	Good

is a Pentium/100-based machine with a 10.4-inch active-matrix screen, 4X CD-ROM drive (6X is now standard), and average performance, making it a good high-end value system. At \$2,299 (street), the 6.6-pound, 100-MHz TI Extensa 515 is a compact low-end value system with a 10.4-inch dual-scan VGA display. Although the 515 should get the job done, its performance was below average for its class; the 570CDT was an average performer on all benchmark tests. The 515 is similar to the Acer Note Lite, reviewed elsewhere in this roundup. TI also sells the TravelMate series of high-end notebooks (not reviewed here).

The Extensa systems share some features, such as two Type II PC Card slots, 28.8-Kbps PC Card modems, and external VGA, parallel, serial, and PS/2-style connectors. Both have nickel hydride batteries; the 515 scored 2:49 on our BatteryMark test; the 570CDT, 2:09.

The 570CDT includes 256K of synchronous SRAM and a 1GB hard disk.

The 515 has no external cache and has a smaller 774MB hard disk. The 570CDT also has a drive bay that can house a floppy disk drive, CD-ROM drive, or second battery. The 515 offers an internal floppy disk drive and an easy-to-remove keyboard, affording ready access to the unit's in-

ternal components.

The lack of cache affected the 515's performance, making its test scores some of the lowest in its category; none were average. The 570CDT was an average performer on our benchmark tests for its class.

TI offers 24-hour, 7-day technical support. The Extensas' warranty guarantees replacement parts and three-day desk-to-desk service for one year.—**CL**

TI Extensa 570CDT. Street price: \$3,999.

TI Extensa 515. Street price: \$2,299. Texas Instruments Inc., Dallas, TX; 800-848-3927, 817-771-5856; <http://www.ti.com>. *Circle 527 on reader service card.*

Toshiba America Information Systems

Tecra 720CDT, Satellite Pro 420CDT

The 133-MHz presentation-class Tecra 720CDT (\$6,299 street) and the 100-MHz high-end value Satellite Pro 420CDT (\$4,198 street) from Toshiba America Information Systems prove that the features gap between a high-end notebook and a budget-priced workhorse doesn't have to be wide. With 6X CD-ROM drives and strong performance, both units are solid choices for travelers. Toshiba aims its Satellites at demanding but budget-conscious users, while the multimedia-equipped Tecras are meant as desktop replacements. Toshiba also offers the Portégé line of lightweight notebooks.

Both units' CD-ROM and floppy disk drive modules are interchangeable; you can also insert the floppy disk drive into a slim case for use as an external drive. Each also offers an IrDA infrared port and inte-

SERVICE & RELIABILITY

Toshiba America Information Systems

Reliability	Better than average
Repair	Better than average
Technical support	Better than average
Percent needing repair	Better than average

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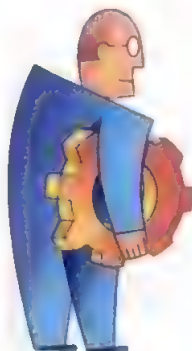
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grated 16-bit audio; the Satellite Pro has one speaker, while the Tecra offers two. Both support the new Zoomed Video port (ZV Port) standard, which improves video performance by allowing video data to bypass the system bus.

A convenient feature in the 8.6-pound (travel weight) Satellite Pro is its built-in AC adapter. Our test unit had a 776MB hard disk; by the time you read this, the system is set to have a 1.3GB disk for the same price. Its 11.3-inch active-matrix display offers SVGA resolution.

The Tecra (10.3-pound travel weight) is truly a high-technology showcase. Its 12.1-inch TFT display is the only one in this roundup with a resolution of 1,024-by-768. System memory can be upgraded to 144MB, far more than any other tested system. The unit came with a built-in 28.8/14.4-Kbps voice modem and a 1.3GB hard disk. A docking station (\$949) is also available.

Both units use Chips and Technologies' new 65550 64-bit graphics chip set with 2MB of EDO DRAM, which helped garner an above-average Graphics WinMark 96 score for the Tecra and an average score for the Satellite Pro. Each earned above-average CD-ROM WinMark 96 results, and the Tecra also had above-average CPUmark scores. All other test scores were average for each machine. The Satellite Pro and the Tecra, each using a lithium ion battery, also fared well on our BatteryMark test, lasting 3:28 and 2:42, respectively.

Toshiba's three-year warranty covers all components except batteries, which are covered for one year. A year of on-site service is \$49.95. Toshiba offers 24-hour, 7-day technical support.—RSA

Satellite Pro 420CDT. Street price: \$4,198.
Tecra 720CDT. Street price: \$6,299. Toshiba America Information Systems, Irvine, CA; 800-334-3445, 714-583-3000; <http://computers.toshiba.com>. Circle 528 on reader service card.

Twinhead Corp.

Slimnote 875CX, Slimnote 8100TX, Slimnote 8120TV

Twinhead's three Slimnote entries—the 8120TV, the 8100TX, and the 875CX—are packed with high-end features: All are equipped with CD-ROM drives, swappable components—including



Twinhead 8120TV (with port replicator), Unisys.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
Twinhead Slimnote 875CX	Fair	Fair
Twinhead Slimnote 8100TX	Good	Fair
Twinhead Slimnote 8120TV	Good	Good
Unisys Aquanta MN	Good	Good

an upgradable processor module—and NTSC/PAL video output, allowing business travelers to give presentations on a TV. The 8120TV and the 8100TX also boast good performance; the 875CX did not perform as well. Designed for users who need a presentation machine, the \$4,195 (street), 120-MHz 8120TV showcases an 11.3-inch SVGA active-matrix display. The 100-MHz high-end value 8100TX (\$3,775 street) has a more modest 10.4-inch SVGA active-matrix display for the general business user, and the \$2,965 low-end value 75-MHz Slimnote 875CX has a 10.4-inch SVGA dual-scan screen.

The three systems share a basic design also found on the ARMNote TS80CD-133TX and the DFI 7200TC (both reviewed elsewhere in this roundup).

The Slimnotes' cases pack a lot of features. All three come with 256K of synchronous cache, Cirrus Logic CL-GD7543 graphics chip sets, and a Megahertz 28.8/14.4-Kbps PC Card fax modem. 16-bit stereo sound is provided by embedded speakers on the wrist rest. Also embedded on the wrist rest is a very responsive Synaptics touch pad. The modular bay can support either a floppy disk drive, 4X CD-ROM drive (6X will be standard by the time you read this) or a second battery.

Both the 8.2-pound 8100TX and the 8.1-pound 8120TV (travel weights) were average performers within their categories across our tests. The 8.3-pound 875CX did not fare as well: It had below-

average results on all of our tests. The systems' lithium ion batteries produced timings of 1:37, 1:49, and 1:47 for the 8120TV, 8100TX, and 875CX, respectively, on our BatteryMark test.

The Slimnotes come with a standard set of ports, including external VGA and IrDA 115-Kbps infrared I/O. Also included are ports for microphone in and audio line out, as well as a connector for a game or MIDI device.

A port replicator, available for \$199, adds a second serial port and another PS/2 port. All three systems come with a one-year warranty.—CL

Slimnote 8120TV. Street price: \$4,195. **Slimnote 8100TX.** Street price: \$3,775. **Slimnote 875CX.** Street price: \$2,965. Twinhead Corp., Milpitas, CA; 800-995-8946, 408-945-0808; fax, 408-945-1080; <http://www.twinhead.com>. Circle 529 on reader service card.

Unisys Personal Computer Division

Aquanta MN

The super-modular \$4,694 Aquanta MN from Unisys Personal Computer Division has all the components necessary to make an acceptable desktop replacement. Unfortunately, the piece that gets lost in the shuffle is performance: This 120-MHz Pentium unit lagged behind most of the other high-end value systems on our tests. The Aquanta MN is part of Unisys's new Aquanta series of customized servers, desktops, and notebooks.

The Aquanta notebook's key asset is its modularity: All front components can be removed. Two bays that can house an internal AC adapter, a nickel hydride battery, a floppy disk drive, or a second battery. Also available is a lithium ion battery specifically for use with the 4X CD-ROM drive module (they lock together).

The unit features a 10.5-inch TFT display, 1.1GB removable hard disk, 16-bit audio, two speakers, an integrated micro-



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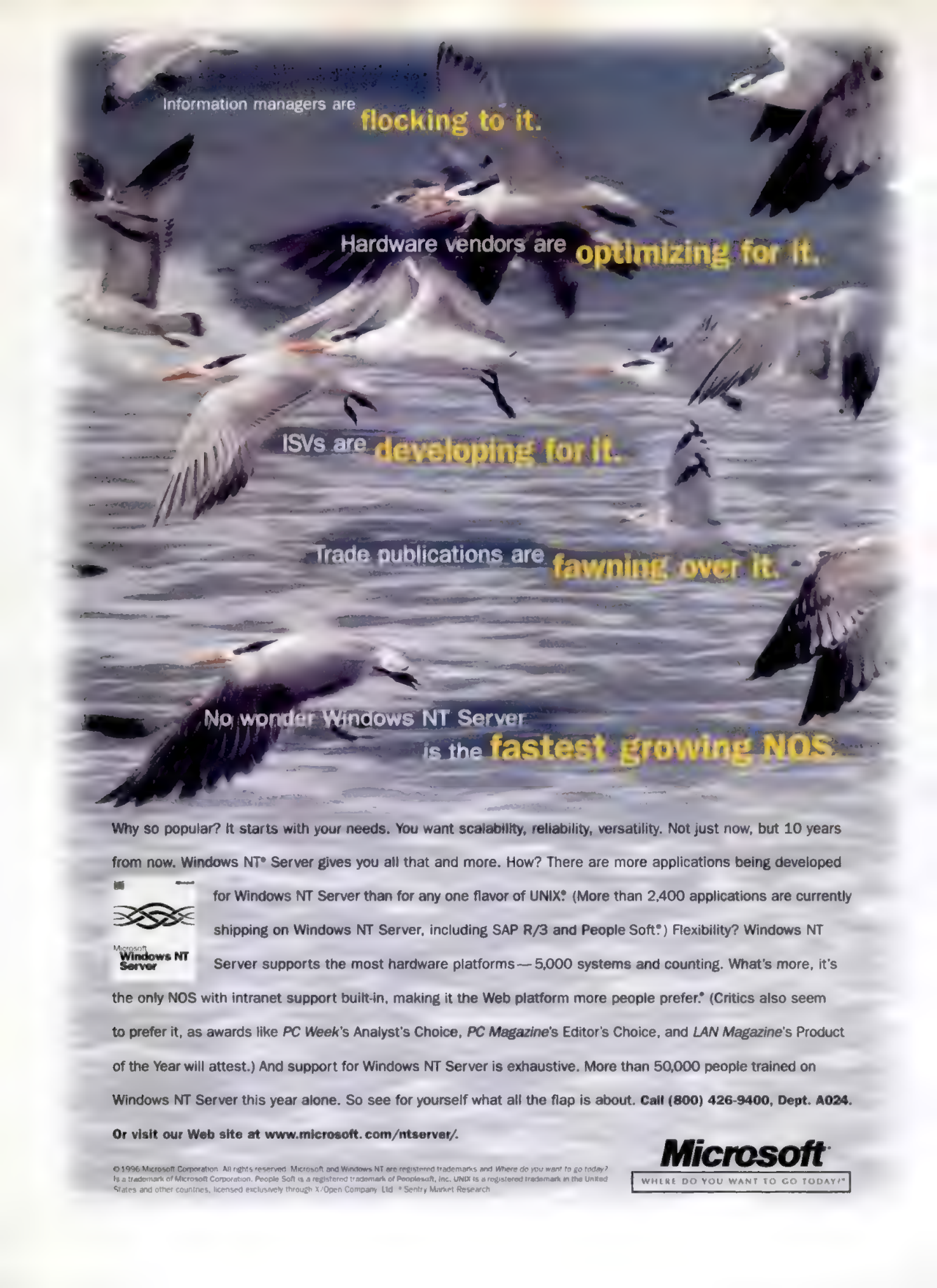
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phone, and a touch pad. It also came with a 28.8/14.4-Kbps PC Card fax modem. Rear ports include the standard I/O connectors, an IrDA infrared port, and an expansion connector for an additional \$107.

The unit did not perform well on our tests. Its Winstone and Graphics WinMark 96 scores were below average for its class. Its Disk and CD-ROM WinMark 96 scores were average. When tested with the lithium ion battery and the CD-ROM module, the system lasted 1:00 on our BatteryMark test. The travel weight is 7.7 pounds. The system has a three-year warranty.—*RSA Aquanta MN*. List price: \$4,694. Unisys Personal Computer Division, San Jose, CA; 888-278-2682, 408-434-2848; fax, 408-434-2001; <http://www.pc.unisys.com>. Circle 530 on reader service card.

WinBook Corp.

WinBook FX, WinBook XP5 P100, WinBook XP5 P120



WinBook combines high-end components and solid performance with reasonable prices in its three notebook entries. We received the \$4,079 WinBook FX, a full-featured presentation unit; the \$3,679 high-end value WinBook XP5 P120, aimed at corporate users who don't need presentation capabilities, and the Editors' Choice \$2,599 low-end value WinBook XP5 P100, geared to business users who don't need the power of the P120 model. (All prices are direct.) Using a lithium ion battery, each performed well on our BatteryMark test.

The FX, manufactured by Quanta Computer, is also being offered by Austin as the \$4,171 Austin Edge CD and by AST as the \$4,499 Ascentia P50.

Assisted by EDO DRAM, 256K pipelined-burst cache, and a Cirrus Logic CL-GD7543 graphics chip set, the FX posted average scores on our Winstone tests, as well as on the CD-ROM and Graphics WinMark 96 tests. Its 1.2GB Toshiba hard disk contributed to a below-average score on our Disk WinMark 96 tests. However, the FX lasted for an impressive 3:46 on our BatteryMark test.



WinBook FX.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
WinBook FX	Good	Good
WinBook XP5 P100	Fair	Good
WinBook XP5 P120	Good	Good

The FX features an 11.3-inch active-matrix screen (12.1-inch screens are also available) and has an 8.3-pound travel weight. Its 4X TEAC CD-ROM drive can be replaced by a standard floppy disk drive or a second battery. By the time you read this, an internal 28.8-Kbps modem is set to replace the PC Card modem we received.

The XP5s were among the lightest in this roundup: The XP5 P120 weighed in at 6.7 pounds for travel, and the XP5 P100 just slightly more at 7.1 pounds. The XP5 P120 has the larger Toshiba 1.3GB hard disk, a Chips and Technologies 65548 graphics chip set, and an 11.4-inch TFT screen. The XP5 P100 has a 10.4-inch DSTN screen, a Toshiba 776MB hard disk, and a C&T 65535 graphics chip set. Both XP5s include a 14.4-Kbps internal modem but no CD-ROM drive.

Both did well on our tests, earning average scores across the board. The XP5 P100 stood out, lasting an impressive 3:52 on our BatteryMark test, one of the longest times of any system in its class. The XP5 P120 lasted 2:50 on our BatteryMark test. The XP5s have an optional (\$399) docking station with a 6X CD-ROM drive; the FX has a \$99 port replicator. All units have a one-year warranty.—*FJE* □

WinBook FX. Direct price: \$4,079. **WinBook XP5 P120.** Direct price: \$3,679. **WinBook XP5 P100.** Direct price: \$2,599. WinBook Corp., Columbus, OH; 800-468-2162, fax, 800-448-0308; <http://www.winbookcorp.com>. Circle 531 on reader service card.

SERVICE & RELIABILITY

WinBook Corp.

Reliability	Average
Repair	Average
Technical support	Average
Percent needing repair	Average

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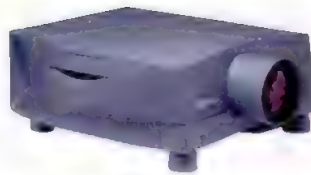
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The 35 Top Portable Peripherals



Now that you've picked the right portable PC to fit your needs, it's time to make the little wonder even more productive. Here, you'll find a variety of hardware add-ons that will make life on the road easier—whether you have to get connected, print a contract, wow an audience, or just get it all from here to there. We evaluate 5 new PC Cards that combine a 28.8-Kbps modem with Ethernet connectivity, 14 of the most versatile PC Card devices, the 4 best portable printers on the market, 5 lightweight LCD projection systems, 4 portable CD-ROM drives, and 3 traveling speaker systems—plus the cases to carry it all.

Ethernet Modems

These new dual-purpose PC Cards provide you with both 28.8-Kbps modem capability and Ethernet connectivity—an elegant combination.

PC Cards are a great way to add capability to your laptop system. Slide in a card and you've got a modem. Slide it out and slide in another, and you've got a network interface card—or a sound card, a SCSI port, or whatever.

Recently, a new class of devices has emerged that combine a modem and network interface in one, taking up just one slot. If you need both a PC Card modem and a network card, these combination cards are worthy of your attention. Aside

from giving you the two functions you need, they solve—or at least minimize—a basic problem many users encounter with portables: not enough PC Card slots. Having both functions on one card means less card swapping; it also lets you use the modem and your network at the same

time. The only disadvantage is that you may get spoiled. If you ever want to move to a different modem or different network card, you'll have to pay more for a new combined card than you would for a modem by itself or a network card by itself.

At the time we tested, five cards—from ActionTec, Motorola, Ositech, 3Com, and Xircom—offered both an Ethernet interface and a 28.8-Kbps modem with fax. The number is growing. IBM, IQ Technologies, NovaLink, and Olicom all expect to have such cards available by the time you read this; MegaHertz also plans to replace its current device with a new model. Prices for the five we reviewed ranged from \$475 to \$549 list; they should sell for about \$380 to \$450 on the street. With only \$70 separating the most expen-

sive from the least expensive, you can base your buying decision entirely on performance and features.

These cards have more similarities than differences. Installation under Windows 95 is straightforward: Insert the card, wait for Windows 95 to detect new hardware, and tell Windows to take the driver from a floppy disk. Note that Windows 95 comes with a prerelease driver for Ositech's Jack of Diamonds, and that it installs that driver without asking (though you'll probably want to replace it with the newer driver that comes with the card). All five cards offer the usual V.42 and MNP 2-4 error control features, V.42 bis and MNP 5 data compression, and top speeds of 28.8 Kbps for data and 14.4 Kbps for fax. All five follow the venerable Hayes AT command set and should work with most software if it is installed for a generic Hayes-compatible modem. Note, too, that all of these cards

come with drivers for DOS, Windows 3.1, and Windows 95; all but the ActionTec card also have drivers for OS/2; and all but the 3Com have drivers for Windows NT or expect to have NT drivers soon.

We tested modem throughput in one direction, which is what you'll usually

need, and in both directions at the same time, which you'll need, for example, with a remote operations program. We didn't exhaustively test fax or LAN performance, although we sent faxes and connected to a LAN to make sure those features worked; none of the cards had any problems faxing, communicating with the LAN, or letting us hot-swap them in and out. The modem performance tests we chose measure average throughput, without compression, over the telephone network model for all tested line conditions.

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Motorola's Marquis and 3Com's EtherLink III LAN+ Modem PC Card offer two important features: automatic power-down and digital phone line protection.

We also determined the weighted overall average throughput for different file types under the best line conditions. On both tests, results for four of the modems were separated by a margin of 10 percent or less. Note, however, that none of these modems can match the AT&T DataPort Express we used for comparison.

The best performer in our test group was the **EtherLink III LAN+Modem PC Card** (\$519 list, \$440 street), from 3Com Corp. This same hardware is sold by Motorola's Mobile Computing Products division as the **Marquis** (\$450 street). Average throughput for the two was 2,993 characters per second (cps), with a weighted overall average of 4,892 cps on our Mixed File Types test suite. The 3Com offering comes bundled with Delrina's WinFax Lite and WinComm Lite, while the Motorola delivers Smith Micro's QuickLink Mobile for data and fax communications. Both are capable packages.

One important feature these two cards offer is digital phone line protection, so you won't damage the modem if you plug it into a digital line. Another nice touch is separate power-saving features for the network and modem sides of the card. Each will go into sleep mode if it's idle for 20 seconds. Missing from the cards is any support for cellular phones, which is available as an option on other cards, and the cards offer only a dongle for 10Base-T connections—



Xircom's Credit Card Ethernet + Modem 28.8, Ositech's Jack of Diamonds, ActionTec Electronics' ComNet 28.8.

BENCHMARK TESTS

Ethernet Modems



Throughput figures for the tested modems were generally very close; the Motorola and 3Com units were the best overall. Note that none of these PC Card devices can approach the throughput of a good external modem.

How We Tested

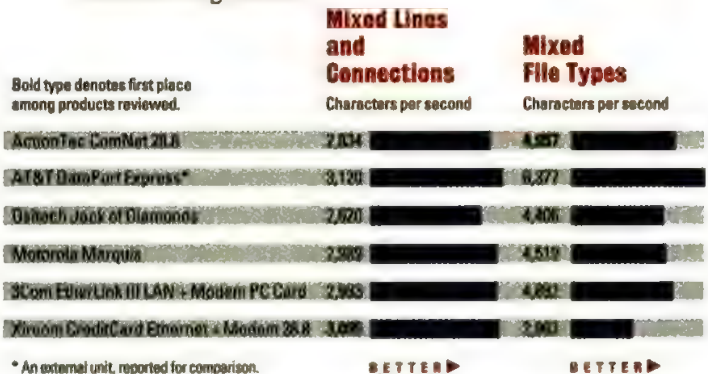
We tested the modem performance of these cards using a subset of our usual modem tests. The full set looks at performance on line conditions that represent 100 percent of the standard model of the telephone network. (This doesn't fully correspond to the actual phone network, but it's a standard model.) The subset we used tests performance for 96 percent of the model, or, in theory, 96 percent of the connections on the phone network.

Normally when we test modems, we use the same modem model on both sides of the link. However, some of the PC Card drivers couldn't support two modems in one test-bed, which forced us to use a standard reference modem in all cases instead. We chose the AT&T DataPort Express, be-

cause in previous tests it has proven to be one of the best overall performers. The test-bed we used was a Dell Dimension 486 DX2/66 equipped with a SwapBox PC Card adapter from SCM Microsystems.

The **Mixed Lines and Connections** test shows a modem's average throughput for 168 simulated types of telephone lines and connections.

The **Mixed File Types** tests show a modem's weighted average in sending five types of files: a vector graphics file, a WordPerfect document, a binary executable file, a random number file, and a file composed of excerpts from those four. Performance was tested while sending files in both directions and simultaneously. The files were compressed to fit in memory and to avoid disk accesses during transfer.



the kind that use RJ-45 modular plugs. Still, these are the only cards in this group that offer both digital phone line protection and power-saving mode—two important features for mobile professionals—and hence merit our Editors' Choice. (3Com Corp., Santa Clara, CA; 800-638-3266, 408-764-5000; <http://www.3com.com>. Circle 451 on reader service card. Motorola Inc., Mobile Computing Products Div., Schaumburg, IL; 800-427-2624, 847-538-5200; <http://www.mot.com/pccards>. Circle 449 on reader service card.)

ActionTec Electronics' **ComNet 28.8** is the least expensive card in this group: \$475 list, \$379 street (including a 10Base-T dongle). You can also get the card with both 10Base-T and 10Base2 connectors for just \$20 more. Performance was among the best, with an average throughput of 2,843 cps and a weighted overall average of 4,957 cps on our Mixed File Types tests. Extras include a cellular option (\$99), available for a dozen brands of phones, and MNP 10 for maximizing performance on poor (read: cellular) connections. The bundled software for data and fax communications is Bitcomm's Bitware. But the ComNet 28.8 has two important

strikes against it: no power-down feature and no digital phone line protection. If you're worried that you might accidentally plug into a digital line and destroy the card, you'll want to look elsewhere. (ActionTec Electronics Inc., Sunnyvale, CA; 800-797-7001, 408-739-7000. Circle 448 on reader service card.)

The **Jack of Diamonds**, from Ositech Communications, comes with a 10Base-T dongle (\$509 list, \$450 street) or with a combination 10Base-T and 10Base2 dongle (\$559 list, \$495 street). The Ositech card offers a power-saving feature, MNP 10 support for cellular connections, and a \$99 cellular option for seven different brands of phones. Missing from the card is digital phone line protection. Also be aware that the performance on our tests was somewhat lower than for the 3Com, ActionTec, and Motorola cards, at 2,620 cps for average throughput, and 4,406 cps on the Mixed File Types suite. The bundled data and fax software package is 01/Faxcom from 01 Communique Laboratory. (Ositech Communications Inc., Guelph, Ontario, Canada; 888-674-8324, 519-836-8063; <http://www.ositech.com>. Circle 450 on reader service card.)

Xircom's **CreditCard Ethernet + Modem 28.8** is available with a 10Base-T dongle (\$489 list, \$415 street) or with dongles for both 10Base-T and 10Base2 connections (\$529 list, \$449 street). Noteworthy features include digital phone line protection and a \$169 cellular option for Motorola phones. For cellular connections, the modem supports ETC, an alternative to MNP 10. Missing from the card is any built-in power-down feature. The bundled software is Delrina WinFax Lite and WinComm Lite.

On our tests, the Xircom card offered the best performance over various line impairments, at 3,055 cps. But it was way behind the pack on the Mixed File Types test suite, with a weighted overall average of 2,963 cps. Although it may be slow, it's the most robust: While the other cards failed at least one of our bidirectional tests, the Xircom managed to send all test files in both directions simultaneously without a hitch. For this reason it merits an honorable mention. (Xircom Inc., Thousand Oaks, CA; 800-438-4526, 805-376-9300; <http://www.xircom.com>. Circle 452 on reader service card.)—M. David Stone

PC Card Devices

Your notebook can become as full-functioned as your desktop PC when you add these versatile, pocket-size cards.

Cut that umbilical cord to your desktop! With the PC Cards we evaluate on these two pages—which represent just a smattering of the products available—you can increase your laptop's storage, talk to scanners or tape drives, edit photos from digital cameras, create videos from live television or any camcorder, play back MPEG films, and more. Here's a subjective sample of several categories and representative cards.

ISDN lines, the medium-speed digital phone lines capable of up to 128-kilobit-per-second (Kbps) transfer rates, serve as the backbone for many companies' videoconferencing and data communications extrastructure. Eicon Technology's **DIVA for Windows 95** and **DIVA for Windows NT** cards (both are \$645 list, \$500 street) take full advantage of the 128K bandwidth and install easily, giving mobile users ISDN access at branch offices, at home, at hotel conference centers, or wherever service has been installed. Right now the cards require a relatively bulky NT-1 network terminator dongle (\$100), though Eicon was readying versions with a built-in terminator that should prove more palatable. Other companies aren't far behind. Connectware now has its **PhoneWorks ISDN To Go** (\$330 street) and **PhoneWorks ISDN + To Go** (\$530 street); both include a headset, NT-1 terminator, and comm and telephony software. Fujitsu was readying its **ISDN Internet Surfer PC Card** (\$369 list), which efficiently uses only one of the two 64K channels available. (Eicon Technology Inc. USA, Dallas, TX; 800-803-4266, 214-239-3270; <http://www.eicon.com>. *Circle 455 on reader service card.* Connectware Inc., Richardson, TX; 800-357-0852, 214-997-4111; <http://www.connectware.com>.

Circle 532 on reader service card. Fujitsu Microelectronics Inc., San Jose, CA; 800-866-8608, 408-922-900. *Circle 456 on reader service card.*)

Many portables don't offer impressive sound capabilities, but you can rectify that with a PC Card sound adapter. One choice is the **IBM PCMCIA 3D Sound Card** (\$109 list, \$90 street), which offers pleasing wavetable synthesis, MIDI in and out, and 16-bit stereo waveform sound capture and playback with 3-D sound for games. To boot, an optional cable adds a dual joystick port to your notebook. (IBM Corp., Somers, NY; 800-426-2968; <http://www.pc.ibm.com>. *Circle 457 on reader service card.*)

For die-hard gamers, New Media's

miracles from video larger than 160-by-120 with 8-bit color at 15 frames per second. Fortunately, programs based on Windows' DirectX and Direct Movies, scheduled for release later this year, should improve video capture results greatly.

As a substitute TV, the Notebook TV Tuner's picture quality ranges from acceptable (in a 320-by-240 window) to passable (shown full-screen). The often-jerky video, poor controls, and poor reception in certain locations (such as airports, where you might like to kill idle time by watching TV) makes this card more a novelty than a breakthrough device. (Nogatech Inc., Cupertino, CA; 408-342-1400; <http://www.nogatech.com>. *Circle 461 on reader service card.*)

You can get better video capture with the right notebook and a **Toshiba ZV Capture Card** (\$399 list), one of the first generation of PC Cards to use the new CardBus and Zoomed Video PC Card standards. CardBus, now appearing on high-end notebooks, allows cards and their host machines to use 32-bit bus mastering and operate at 33 MHz to deliver PCI bus-like transfer rates. CardBus slots can use legacy PC Cards, but older PC Card interfaces can't use this new type of card. Zoomed Video (ZV), available

now on only a few notebooks, gives PC Cards direct access to the notebook's video controller, making the display of high-speed, uncompressed video possible.

Toshiba's Capture Card is switchable between ZV and CardBus/16-bit mode to work with all computers. When mounted in the ZV slot of a Toshiba Tecra 720CDT (a 133-MHz Pentium notebook with a 1,024-by-768 display), the Capture Card showed the best capture performance, grabbing 320-by-240, 30-fps video in true color with an acceptable 10 percent dropped frames. (Toshiba America Consumer Products Inc., Buffalo Grove, IL; 800-344-8446, 847-541-1927; <http://www.toshiba.com>. *Circle 464 on reader service card.*)

ZV technology in Marge Systems' \$199 **MPEG-to-go** card lets notebooks play video CDs and other MPEG-1 titles. On the Toshiba Tecra 720CDT, Vision Interactive's ESPN's Unbelievable Sports Plays



These three PC Cards stood out. Margi Systems' MPEG-to-go elegantly adds MPEG playback capabilities. Integral's Viper hard disks are fast and provide essential storage space and shareability. Adaptec's SlimSCSI should be in any road warrior's arsenal.

GAMEjammer (\$199 list, \$182 street) delivers monaural 8-bit sound, an OPL-2 synthesizer, MIDI in and out ports, a tiny speaker in the card, and a joystick port on the dongle. The card consumes no power when not in use, and its Sound Blaster compatibility lets you share the experience of Microsoft Fury³ at 30,000 feet. (New Media Corp., Irvine, CA; 800-227-3748, 714-453-0100; <http://www.newmediacorp.com>. *Circle 460 on reader service card.*)

Before, only a desktop computer could digitize video. But now several offerings enable your notebook to capture still-frame or motion-video clips. Nogatech offers a pair of PC Cards, the **CaptureVision** (\$499 list, \$350 street) and the **Notebook TV Tuner** (\$599 list, \$415 street) cards. Both capture NTSC or PAL video at 24-bit color depth with full stereo sound. For motion video capture, these devices are on par with ISA-bus capture boards; don't expect

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Full-Function
Notebook

Lithium Ion
Battery

Internal
Diskette Drive



Detachable
lithium ion
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also
functions
as a
handle
and a
keyboard
tilt.

Choice of SVGA
displays from
11.3" CSTN
to 11.8" TFT.



Programmable keys provide
one-touch access to mobile
applications.

Up to 133 MHz
Pentium® processor,
hard drives up to 1 GB.

I want a notebook that's as flexible as I am. I want it to be full function with a long-lasting battery.



COMPAQ

and Philips Media's Clear and Present Danger CD-ROM looked excellent in a 320-by-240 (native MPEG-1) window. Expanding the films to full screen tended to blur edges and image details, but the quality was still acceptable, and the Margi MPEG-to-go merits an Editors' Choice as an elegant portable video playback solution. (Margi Systems Inc., Fremont, CA; 510-657-4435. *Circle 459 on reader service card.*)

Some notebooks are hot items—"hot" as in *stolen*. Safe-guard Insurance Co. estimates that one out of 13 portable computers was lost or stolen last year. The loss of data (or having your laptop-based credit card and bank account information fall into the wrong hands) may be more costly than the notebook. One defense is to encrypt key data and store it on your laptop or a dedicated card.

The **SwapCrypt** (\$99 street), from SCM Microsystems, builds an encryption program into the card's flash memory and provides ultra-secure encryption and decryption of files or directories. The SwapCrypt offers unbeatable security, though its user interface was less intuitive than it could be; SCM expects to have an improved version out by year's end. Centennial Technologies' **Crypta Plus** (\$399 for 4MB; \$799 for 12MB) takes a different approach, using a hardware encryption engine with 4MB to 12MB of flash memory to store sensitive files off-line. (SCM Microsystems, Los Gatos, CA; 408-370-4888; <http://www.scmmicro.com>. *Circle 533 on reader service card.* Centennial Technologies Inc., Billerica, MA; 800-942-0018, 508-670-0646; <http://www.cent-tech.com>. *Circle 454 on reader service card.*)

If you want to attach the hottest peripherals to your notebook—scanners, 8X CD-ROM drives, CD-R drives, and a variety of others—you need a SCSI interface. Adaptec's **SlimSCSI** (\$259 list, \$209 street) installs gracefully in Windows 95, and the included EZ-SCSI Software makes short work of installing it under DOS, OS/2, Windows 3.1, and Windows NT. For its simplicity and utility, the SlimSCSI wins an Editors' Choice; it's a good device to have around. The **Fujitsu SCSI 600 Interface** (\$149



If you've got a need and a notebook with a PC Card slot, chances are one of these cards can fill them both.

list, \$120 street) provides the right stuff for Windows 95 but doesn't offer drivers for any other operating system.

On our tests, both cards flawlessly handled several SCSI-1 and SCSI-2 devices, such as the Hewlett-Packard ScanJet IIC, Iomega Bernoulli Boxes, and the Panasonic PD-1000 PD drive. Under Windows 95, each required you simply to plug it in, feed any needed driver (as required with our ScanJet) to Windows 95, and go. (Adaptec Inc., Milpitas, CA; 800-959-7274, 408-945-8600; <http://www.adaptec.com>. *Circle 453 on reader service card.* Fujitsu Microelectronics Inc., San Jose, CA; 800-866-8608, 408-922-900. *Circle 456 on reader service card.*)

Need some removable disk space for securing files, distributing presentations, or adding to your notebook's hard disk space? Integral Peripherals' Viper line of PC Card hard disks merits our Editors' Choice. Integral offers a range of Type III hard disk drives up to 340MB in size (540MB scheduled for 1997) and full plug-and-play compatibility with Windows 95. We tested the \$599 340MB **Viper 8340PA** (\$530 street) and found that it was both large enough to hold huge multimedia projects and faster than the built-in drives of Gateway's 2000 Solo 90 and Toshiba's Tecra 720CDT. Granted, the cards are not without their drawbacks. They are expensive and consume 15 percent more power than standard PC Cards, and the Type III form factor occupies the same space as two Type II cards. But if you need removable media for securing files, distributing presentations, or ex-

panding your notebook's capability, the Viper is an ideal choice. (Integral Peripherals Inc., Boulder, CO; 800-333-8009, 303-449-8009; <http://www.integralnet.com>. *Circle 458 on reader service card.*)

SanDisk makes a series of slimmer, Type II flash memory cards, called **FlashDisks**, that act like standard hard disk drives in sizes from 1MB to 135MB. Flash memory disks are ultrafast (although faster than the Viper only by a whisker) and exceptionally shock-resistant. At \$1,200 for the 85MB drive and \$2,200 for the 130MB, these devices are re-

stricted to specialty applications. Smaller flash disks, however, are ideal for digital cameras, such as the Kodak DC50. The 5MB FlashDisk (\$299) holds about 34 pictures, reasonable in both price and capacity for consumers. (SanDisk Corp., Santa Clara, CA; 408-562-0500; <http://www.sandisk.com>. *Circle 462 on reader service card.*)

You know you're not in Kansas anymore, but where are you? If you're lost in unfamiliar territory, you might wish for one of these GPS receivers. A GPS (global positioning satellite) system uses the data broadcast from 24 orbiting satellites to calculate the receiver's latitude, longitude, and altitude with a precision as close as 10 meters. The **Trimble PC Card 110** (\$595 list), from one of the original names in GPS equipment, uses a three-channel Trimble receiver. Centennial Technologies' **SatNav GPS** (\$795 list, \$500 street) uses a five-channel Rockwell receiver. Both have accuracy of 10 to 100 meters—good enough for real-time location of your position on many electronic automobile map programs, which you'll have to provide yourself. Most of these programs, such as Microsoft's Automap Streets, are GPS-enabled, which means they provide a software bridge to work with the receivers. (Trimble Navigation Ltd., Sunnyvale, CA; 800-865-4850, 408-481-8522; <http://www.drive.net/gps.html>. *Circle 463 on reader service card.* Centennial Technologies Inc., Billerica, MA; 800-942-0018, 508-670-0646; <http://www.cent-tech.com>. *Circle 454 on reader service card.*)—Chris DeVoney

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Multimedia
CD-ROM
3 Lithium Ion Batteries
16-Bit Stereo Sound
Dual Speakers
NTSC/PAL TV Output



I want to use a CD-ROM with full-motion video. I want 3 batteries with up to 10 hours of life.



COMPAQ

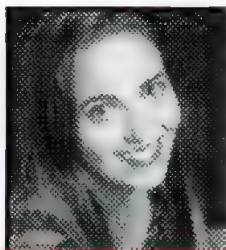
Printers

Four solid choices: Two of these units are light enough to carry all the time; the other two are heftier but deliver color.

There are many reasons to want a lightweight, convenient portable printer to complement your laptop. You can seal a deal at a moment's notice right at the dinner table or doctor a presentation at the last minute in your hotel suite.

Transportable printers fall into two categories. Ultraportable single-sheet units weigh in at 2 pounds or less

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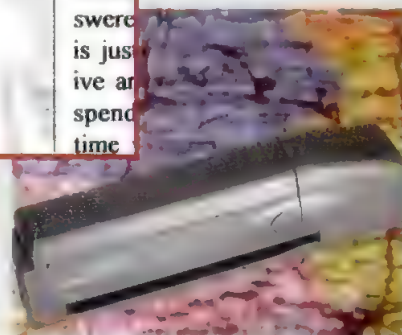


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looks like normal paper but has a coated, slightly slippery feeling—though much nicer to the touch than standard slimy fax



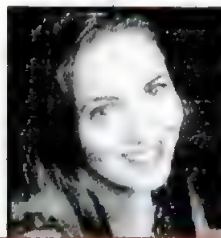
The Citizen PN50 is good for text, but it couldn't reproduce the photo image on our newsletter.

paper (also usable in a pinch). Note also that you can't print in color, and the printer doesn't handle black-and-white photos as well as the ink jet competition. Still, the HP LaserJet IIP-compatible PocketJet is an excellent choice for those who often need to print small text documents on the road, and it once again merits our Editors' Choice. (Pentax Technologies, Broomfield, CO; 800-543-6144, 303-460-1600; fax, 303-460-1628. *Circle 468 on reader service card.*)

The **Citizen PN50** is the lightest of the tested printers (1.7 pounds including AC adapter) and also the least expensive (\$249 list, \$199 street). It prints very high-quality

text on plain copy paper via a thermal fusion process using heat and pressure to transfer resin-based ink from tiny ribbons directly onto the paper. Its 360-dpi

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The Canon BJC-70 delivers four-color ink jet printing and convenient paper handling in a 4-pound package. For color on the road, it's a winner.

monochrome version of last year's color-capable PN60. The HP DeskJet 340 is an evolved version of the model DeskJet 320; it adds a 30-sheet paper feeder, color cartridge standard, and infrared capability. Print samples from our monochrome newsletter are presented here actual size.

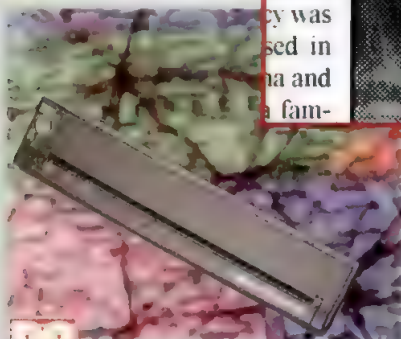
At about 1 inch high by 10 inches wide by 2 inches deep and weighing 2 pounds, the tiny **Pentax PocketJet** is the most portable of the group. The printer and its small AC adapter displace a total of 45 cubic inches—

10 cubic inches less than the next smallest unit, the Citizen PN50. The 300-dpi, monochrome-only Pentax was also the fastest text printer, and its laser-quality text output was razor-sharp.

The PocketJet isn't without its compromises, however. At \$649 list (\$575 street) for the 2MB version, you could buy two of the other printers for the price of the Pentax.

You can purchase another version of the Pentax with 512K RAM for \$459 list (\$449 street). Pentax also sells the PocketJet components individually; for example, the tested 2MB version alone with no cables or case lists for \$499.

With the full version you get all the accessories, including AC adapter, battery, case, and a box of 100 sheets of thermal paper. The biggest drawback here would be having to purchase the paper. Available directly through Pentax or selected distributors, the thermal paper used with the PocketJet (\$7.99 for a box of 100 letter-size sheets or \$9.99 for legal size)



The Pentax PocketJet is light and quick; text output is superb, and it's small enough to carry in your computer bag all the time.

and are ideal if you need a printer with you most of the time. The larger units weigh more (about 5 pounds) and can double for light desktop duty. They come with sheet feeders and offer color capability but are better suited to occasional than frequent travel.

We tested four portable printers. The Citizen PN50 thermal fusion and Pentax PocketJet direct thermal monochrome are ultraportables that print only monochrome. The Canon BJC-70 and HP DeskJet 340 are somewhat bulkier—though more full-featured—color ink jet models. The Canon and Pentax printers were Editors' Choice winners last year ("Portable Printers: Fewer Trade-Offs," August 1995) and are virtually the same (though this year's Pentax has 2MB RAM, up from 512K). The Citizen PN50 is a

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Slimline

5.1 Lbs.

1.5" Thick



Memory expandable
up to 48 MB.

Touchpad can be
replaced by an optional
trackball.

Internal diskette
drive is replaced
by a battery.

I travel light, real light. I don't need a floppy. And I want it all at around 5 lbs.



COMPAQ

BENCHMARK TESTS

Printers



The fastest portable printer of the four was also the smallest: the Pentax PocketJet. The Citizen PN50 was much slower than the others. The Canon and HP color ink jets performed as well as desktop models.

The Pentax PocketJet is able to print quickly because, like a thermal fax machine, it prints the full width of the page at the same time. The Citizen PN50 shuttles a carriage back and forth across the page, unwinding a ribbon similar to that of a conventional typewriter and using heat and pressure to bond ink to the paper as it moves from side to side. This hurts its print times tremendously.

The two ink jet units in the group, the Canon BJC-70 and HP DeskJet 340, were fairly comparable in terms of speed. And their portability doesn't seem to detract from performance: Times on these tests were on a par with those of conventional low-end ink jet printers.

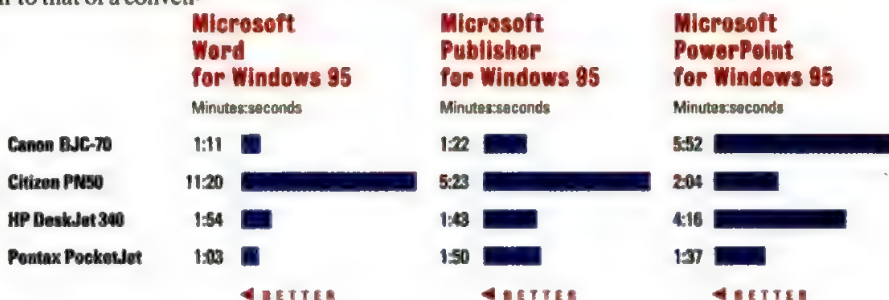
How We Tested

We used a 120-MHz Dell Latitude XPi notebook computer with 16MB RAM. We printed all documents on plain paper except for those from the Pentax unit, which requires thermal paper. Each of the printers can operate with a rechargeable battery, but all testing was done with AC power.

The **Microsoft Word for Windows 95** test measures the time it takes to print a two-page text document that contains multiple fonts and type sizes.

The **Microsoft Publisher for Windows 95** test measures the time it takes to produce a one-page newsletter-type document with multiple fonts and type sizes, a halftone image, and line art.

The **Microsoft PowerPoint for Windows 95** test measures how long it takes to print a one-page color graphic that contains a pie chart and bar graph on a gradient-fill background.



output is waterproof and smear-resistant; one ribbon (\$9.99) is good for up to 30 text pages. Like the PocketJet, the PN50 feeds only one page at time, requiring tending during printing. This can try your patience, as it took over 11 minutes to print our two-page Word for Windows document. Text output looked exceptional; however, the unit was horrible at reproducing the halftone photo on our sample newsletter. The PN50 is not the best solution for printing gray-scale images or graphics but is fine for occasional text printing. (Citizen

time for true four-color printing or use a black-only tank for longer text runs. Print quality is quite consistent in black and good with color using the 720- by 360-dpi maximum resolution. The Canon's lid flips up to feed 30 sheets of paper (or 5 envelopes) and functions easily. This printer is once again the Editors' Choice winner

for portable color use. (Canon Computer Systems Inc., Costa Mesa, CA; 800-848-4123, 714-438-3000; <http://www.ccsi.canon.com>. Circle 465 on reader service card.)

Hewlett-Packard's **HP DeskJet 340** (\$365 list, \$299 street) has evolved nicely from the original DeskJet 300, adding a new clip-on 30-sheet paper feeder, a color ink cartridge and cartridge holder standard, and convenient infrared capability for cable-free printing (with an IR-equipped laptop). The 5.3-pound (with AC adapter) DeskJet is the heaviest and bulkiest of the tested printers, and that doesn't include the 1-and-a-half-pound sheet feeder.

The 300-dpi output quality may look familiar; the basic print engine is the same used in the venerable desktop DeskJet 540. A three-color printer, the DeskJet 340 requires that you switch ink cartridges as you change print jobs from black only or color. The printer produces very clear text and good quality gray-scale images, with some minor graininess. The color slide output was the best of the tested portable printers, with consistently rich colors. Unlike the Canon, though, it cannot handle envelopes. The DeskJet 340 is a sturdy, rugged traveler, though its heft makes it better for occasional treks. (Hewlett-Packard Co., Palo Alto, CA; 415-857-1501, 800-752-0900; fax, 800-333-1917; <http://www.hp.com>. Circle 467 on reader service card.)—Bruce Brown

America Corp., Santa Monica, CA; 800-477-4683, 310-453-0614; fax, 310-453-2814; <http://www.citizen-america.com>. Circle 466 on reader service card.)

The smaller and lighter of the two portable color ink jet printers, the **Canon BJC-70** (\$329 list, \$299 street price) weighs 4 pounds including the adapter. You can put black as well as cyan, magenta, and yellow ink tanks into the BJC-70 at the same



Hewlett-Packard's DeskJet 340 is bulkier than the others, but it delivers good color output.

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4

Virtual
Office

SpeedPak 288
Telephony Modem

Full Duplex
Speakerphone*

Answering
Machine*

Fax
Machine*

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operates via phone line
or cellular phone.*

*Just Connect
Communication
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system. 16-bit
stereo sound in
any configuration.*

I want sound. Big, big sound. I want a full duplex speakerphone so they can hear me in Texas.



COMPAQ

LCD Projectors

The newest LCD projectors deliver bright, sharp images and multimedia capabilities in self-contained, totable packages.

The typical road warrior is self-sufficient, carrying all the computing resources needed to conduct business anywhere, anytime. But it's impossible to get a half-dozen sales prospects to share the view on a typical portable's LCD screen.

If you want to be self-reliant, you need to bring your own large display with you. For years, LCD projection panels have been favored in the marketplace. These small, lightweight devices (about the size of your laptop PC) let you make presentations at any site that could provide a bright enough overhead projector—which, alas, could prove a stumbling block.



Lightware's Viewpoint was by far the smallest and lightest projector in our group—under 10 pounds—and still the second-brightest.

Self-contained LCD projection systems address this shortcoming: These units combine the light source of the overhead projector with the color display of an LCD panel and have lots of added advantages. Since the LCD panels used inside don't have to fill the stage of an overhead projector, they can be smaller, which helps projectors stay price-competitive. Most LCD projectors

also include internal speakers for multimedia presentations. According to Pacific Media Associates, LCD projectors outsold LCD panels for the first time in 1995 in terms of total dollars spent and should surpass them in annual unit sales by 1997.

Brightness is one of the most important features in a projector. Every manufacturer wants to be able to claim that you can view images in a room with normal lighting. Some projectors use standard halogen projection lamps that have 30- to 40-hour useful lives and are widely available for about \$10 to \$50 apiece. Others use metal halide lamps; these have life spans rated at 350 to 1,000 hours but cost \$350 to \$400 each. On our tests, there did not appear to be any difference in brightness based on the type of lamp, and in terms of operating costs, it appears that you can plan on spending up to a dollar per hour no matter which type of lamp your projector uses. One difference is that it costs less to pack spares of the halogen variety, and you

Digital Light Processing: It's All Done with Mirrors

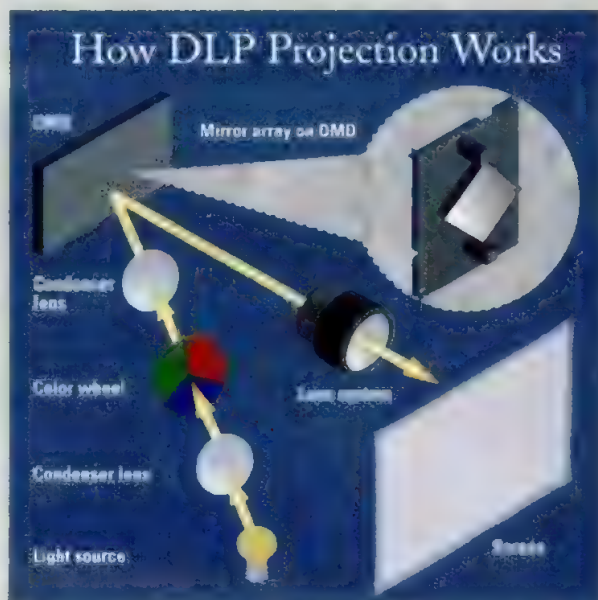
One of the biggest design flaws of LCD technology for projectors is that it's transmissive: It creates an image by blocking the passage of light. An LCD panel can absorb as much as 90 percent of the light produced by the bulb. For a bright image, you want as much light as possible to reach the screen.

Another approach relies on reflective technology. Texas Instruments has created a whole new projection system, called Digital Light Processing (DLP), that uses tiny mirrors to reflect light. DLP applications include big-screen TVs and even laserlike printers. The mirrors, part of a Digital Micromirror Display (DMD), are fabricated on semiconductor chips in much the same way as integrated circuits.

Instead of transistors, however, the surface of a DMD chip is covered with tiny mirrors. An electrical signal sent to a mirror tilts it. In one position, the mirror directs light through the display's optical system and onto the

screen; in another, light does not hit the lenses, so that pixel is off. Most DLP projectors use one DMD device and a spinning color filter wheel to color the light beams red, green, or blue.

No DLP projectors were ready for testing in time for this review, but InFocus, nView, Proxima, and others were showing preproduction units; products should be shipping by the time you read this. Beta units we saw offered significant advantages in terms of image quality and brightness. The first DLP projectors will be priced in competition with the more expensive LCD projectors, probably in the \$10,000 range. The initial units also will weigh



more than 20 pounds and generally be larger than the more portable LCD projectors reviewed here. DLPs will certainly be in the "luggable" class, though, and could be suitable for occasional road trips.—AP

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lose less if a lamp should be damaged by rough handling.

To put the units through their paces, we set them up in a medium-size (20 by 12 feet) conference room setting and projected the images onto a 6-foot screen. We used a Gossen Panluc Electronic 2 light meter (registering footcandles) to measure brightness in the center of the screen. Most projectors are brightest at the center, with light levels dropping off as you move to the corners. Better projectors show less such roll-off, so to measure the difference we also took light readings at four points around the perimeter of the screen.

For this mini-roundup we tested five different units: the Epson ELP-3300, the InFocus LitePro 210, the Lightware Viewpoint 100, the Proxima DP2810, and the Sharp XG-E650UB Mark II. These bracket the low end of the market, ranging in list price from \$5,500 to \$9,600. The units are similar in many ways. All deliver 640-by-480 resolution; the Epson and InFocus units can automatically compress an 800-by-600 signal, but generally those who need higher resolutions will need to look to larger projectors or to panels, at least for now. All five can produce 16.7 million colors; can handle PAL, SECAM, and NTSC video signals as well as RGB data signals from a computer; and come with remote controls with on-screen menus for configuration settings.

The 17-pound **Epson ELP-3300** (\$9,599 list, \$6,500 street) is the only projector in the group to use poly-silicon TFT (thin film transistor) panels. The others use

SUMMARY OF FEATURES

Portable LCD Projectors

PC MAGAZINE
EDITORS' CHOICE

■ YES ■ NO	Epson ELP-3300	InFocus LitePro 210	Lightware Viewpoint	Proxima DP2810	Sharp XG- E650UB Mark II
Products listed in alphabetical order					
List price	\$9,599	\$5,999	\$6,500	\$5,995	\$5,495
Dimensions (HWD, in inches)	5.9 x 11.2 x 16.3	8.5 x 16.4 x 13.3	6.5 x 10.0 x 12.5	5.9 x 13.1 x 17.0	7.7 x 12.5 x 16.6
Weight (pounds)	18.9	16.0	9.4	21.5	19.5
Carrying case	Soft, \$80; hard, \$249	Soft, \$100	Soft, \$99; hard, included	Soft, \$189; hard, \$429	Soft, \$110; hard, \$175
LCD type	Poly-silicon TFT	Amorphous TFT	Amorphous TFT	Amorphous TFT	Amorphous TFT
Resolution	640 x 480	640 x 480	640 x 480	640 x 480	640 x 480
Automatically compresses 800 x 600	■	■	■	■	■
Lamp type/Rated lumens	Metal halide/350	Metal halide/250	Halogen/270	Halogen/300	Metal halide/220
Rated hours/Replacement cost	600, \$400	350, \$350	40, \$15	30, \$50	1,000, \$350
Zoom lens	Included	\$750	None	None	Included
Number of speakers	2	2	2	2	1
Watts per channel	1	5	3	3	5
Video inputs	S-Video, composite	S-Video, composite	S-Video, composite	S-Video, composite	S-Video, composite
Number of RGB inputs	1	1	1	1	1
Other inputs	Remote tether, serial, stereo	Microphone, mouse, remote tether, stereo	Stereo (2 inputs)	Serial, stereo (2 inputs)	Stereo (2 inputs)
Y-cable for monitor	■	■	■	■	■
Warranty (parts and labor)	1 year	1 year	1 year	1 year	1 year

amorphous-silicon TFT active-matrix panels, which are less expensive yet still provide adequate response time for video images. A poly-silicon design, though, offers a number of advantages. These TFTs have faster response times for near movie-quality video. The transistors at each pixel are smaller, which means that they block less light than an amorphous-silicon design, which in turn means that the panels can be smaller yet still produce a brighter image.

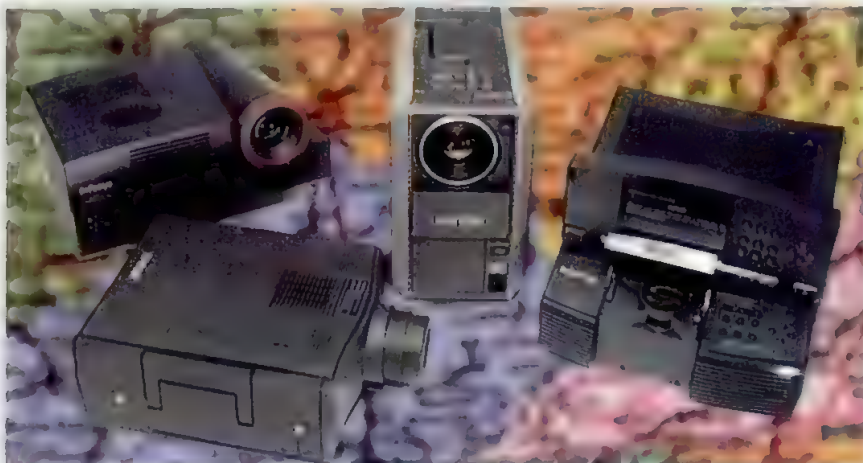
The Epson is also the only one of the five that has three LCD panels—one each

for red, green, and blue—where the other projectors have only a single panel. This can help create sharper and brighter images, and on our tests the Epson was nearly a third brighter (10.7 footcandles average across all five measured locations) than the next closest projector. The Epson was also noticeably the best in terms of brightness uniformity, with its dimmest corner 70 percent as bright as the center. The unit also comes with a zoom lens standard.

Epson provides the standard one-year warranty on parts and labor but adds overnight replacement under warranty and backs the expensive metal halide lamps for 90 days. (Epson America, Torrance, CA; 800-463-7766, 310-782-0770; <http://www.epson.com>. Circle 469 on reader service card.)

At about \$2,000 less, the **LitePro 210** (\$5,999 list, \$4,500 street) from InFocus Systems is a strong contender. It weighs just over 17 pounds and produced 6.1 average footcandles on our tests, with 35 percent uniformity. The real selling points, though, are the creature comforts.

The LitePro had the best cable arrangement of all: A CableWizard quickly changes from Mac to PC configuration and provides clearly marked attachment points for all the cables from



Portable LCD projectors of all shapes and sizes: The Epson ELP-3300, the InFocus LitePro 210, the Sharp XG-E650UB Mark II, and the Proxima DP 2810.

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[†]Prior to purchase, please contact your local dealer/distributor for the correct version to ensure compatibility with the ISDN switches in your area.
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your PC and monitor. The LitePro also boasted the best audio of the lot; designed by JBL, the sound system produces 10 watts per channel for room-filling audio without distortion. And while other projectors have remote controls with lighted buttons, the LitePro remote is the best of the bunch, because it also provides a positive tactile and audible "click" when a button is pushed, and each button has its own size and shape to make it easier to find the right one without looking. (InFocus Systems, Wilsonville, OR; 800-294-6400, 503-685-8888; <http://www.infs.com>. *Circle 470 on reader service card.*)

First and foremost for the road warrior is size and weight, and here a newcomer stole the show. Lightware's **Viewpoint 100** (\$6,500 list and street) is about one-third the size of the other projectors, and at just over 9 pounds (excluding case and cables), it is roughly half the weight of the others in the group. It packs plenty of brightness despite its size and managed to

come in second for uniformity and average brightness (7.7 footcandles average with 39 percent uniformity). Nice touches include an interesting "curtain" effect that you could use to cover the screen (with user-configurable colors) and an on-screen pointer that you can pop up to point out items on the image. It also comes with a hard case as standard.

With its nice balance of size, weight, image quality, and brightness, the Viewpoint merits an Editors' Choice. It is definitely the way the portable projector market is moving. (Lightware Corp., Beaverton, OR; 800-255-9469, 503-641-7873. *Circle 471 on reader service card.*)

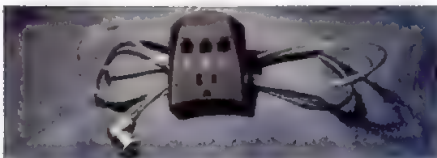
A little smaller than a VCR, the 21-pound **Proxima DP2810** (\$5,995 list, \$5,150 street) is a solid all-around value. It produced 7 footcandles average on our tests and 35 percent uniform brightness. A neat feature here is the Cyclops interactive pointer option (\$495), which acts as an on-screen mouse; it lets you control your PC by pointing at the image projected on

the screen. (Proxima Corp., San Diego, CA; 800-447-7692, 619-457-5500; <http://www.prxm.com>. *Circle 472 on reader service card.*)

Finally, the **Sharp XG-E650UB Mark II** (\$5,495 list, \$4,995 street) trails the others we saw in terms of image quality and convenience. At almost 20 pounds, the Sharp was one of the heaviest units. Its 5-foot-candle average put it last in overall brightness, and it was only 30 percent as bright in the dimmest corner as it was at the center, which was the poorest uniformity of the bunch. Its single speaker is adequate to fill a room, though it does not deliver stereo reproduction (there are stereo-out jacks for external speakers). On the plus side, Sharp backs its one-year warranty with free on-site service. Sharp plans to introduce a new model, the XGE670U, which should address some of these shortcomings. (Sharp Electronics USA, Mahwah, NJ; 800-237-4277, 201-529-8731; <http://www.sharp-usa.com>. *Circle 473 on reader service card.*)—*Alfred Poor*

Cases and Accessories

Now that you've got all your gear, you have to get it from here to there.



MicroSaver (\$59.95), SurgeArrest Notebook Protector (\$29.95)

Simply attach the MicroSaver lock, from Kensington Microware (800-535-4242, 415-572-2700), to your machine and loop the cable around any stationary object. It's a modest investment that could help deter thieves. *Circle 480 on reader service card.* American Power Conversion's (800-877-4080, 401-789-5735) portable AC surge suppressor, the SurgeArrest Notebook Protector, protects your portable from power spikes. *Circle 982 on reader service card.*



Kensington Wetsuit (\$39.95)

This stylish little bag from Kensington Microware isn't so much a laptop case as a second skin for your portable. Made of stretchy neoprene (like real wetsuits), the Wetsuit wraps around your computer and stays put with elastic straps. It comes in five different sizes and in bright colors—fuchsia, electric blue, purple—announcing that these are no ordinary bags. A zipper pouch on the outside has room for only a couple of disks and PC Cards, so the Wetsuit is for short hauls. The professional globetrotter may want a bigger bag for extra batteries, drives, AC adapter, and so on, but the Wetsuit lets you hop from meeting to meeting or from work to home with attitude. To complete the look, Kensington offers matching Wetsuit carriers for CD-ROMs (12-CD carrier, \$12.95; 36-CD carrier, \$29.95) and floppy disks (10-disk carrier, \$9.95; 30-disk carrier, \$19.95). *Circle 480 on reader service card.*



MMI Winglove (\$79.00)

If the Wetsuit is a flashy sports car, the Winglove, from Mississippi Micro (800-513-5090, 601-281-8178), is a luxury coupe. The baby-soft black leather was quite possibly too nice: We were almost afraid to road-test ours for fear of scuffing it. But the sturdy sidewalls and metal accessories demonstrate that this bag is solid and functional. The bag flips open so you can use your portable without removing it from the case, and the clamshell design keeps the strap and handle out of the way while you work. Inside, the Winglove offers a wide array of compartments in a compact space. A large pocket holds a day's worth of paperwork, and the outside wall of that space is lined with soft pouches for pens, disks, PC Cards, and other accessories. Best of all, the Winglove costs about \$40 less than similar leather bags. *Circle 482 on reader service card.*

Multimedia

Miss the multimedia power of your desktop machine? Take CD-ROM and sound capabilities with you with these portable toys.

If you don't have a multimedia-ready portable, complete with CD-ROM drive and speakers—or if you need to make presentations on the road and need room-filling sound—you might consider adding one of the many external multimedia devices available. For this mini-review we chose the lightest, most portable 4X CD-ROM drives we could find—less than 2 pounds traveling weight, including cables, batteries, and AC adapter. We also looked at a select few external speaker systems designed for traveling: one ultra-tiny pair ideal for sharing sound around a conference table (or for personal listening



The Altec Lansing ACS-2800 is ideal for conference room presentations. The Cambridge SoundWorks Model Twelve can fill an auditorium.

in your hotel room), and two portable subwoofer-equipped systems that let you present to an audience. We also got a unique 8X CD-ROM player/speaker combination that covers all those bases.

We ran the CD-ROM drives through our usual suite of performance tests. For our speaker evaluations we used a variety of audio CDs (both music and test tones),

a calibrated microphone, and an Audio Precision System One analyzer to measure frequency response.

The Sony PRD-250WN Discman (\$399.95 list) is a 4X CD-ROM drive that supports regular CD, CD-XA, MPC Level 2, and PhotoCD Multisession modes. Its handy display tells track numbers, times, and mode; the display doubles as a charge indicator for the 4 AA or optional lithium ion battery (\$59.99). Installation under Windows 95 was straightforward.

The unit wasn't a performance standout among 4X drives. It was last among the tested units in our CD-ROM WinMark 96 test suite, with a score of 336 kilobytes per second (KBps), and it had the poorest access time: 471 ms (milliseconds), versus 244 ms for the leading drive we tested. It scored respectably on the other tests, taking 3 minutes 54 seconds to load Microsoft Office from CD-ROM to hard disk, and 4:07 to copy our 127MB subdirectory. All told, Sony has put together a simple-to-use, efficient bundle.



L.L. Bean Sportsman's Computer Briefcase (\$99.00), Kensington Deluxe Backpack (\$89.95), Targus Notepac (\$69.00)

Authorities caution that standard black laptop cases are attractive targets for airport thieves. Fortunately, these midsize, soft-sided bags come in colors and shapes not usually found in this market. The Sportsman, from L.L. Bean (800-809-7057), is cleverly disguised to match that company's regular luggage. *Circle 481 on reader service card.* The Deluxe Backpack, from Kensington Microware (800-535-4242, 415-572-2700), is a road-ready backpack on the outside and a fully organized laptop case on the inside. *Circle 480 on reader service card.* The Notepac, from Targus (800-390-4622, 714-523-5429), is the sturdiest of the three; it, too, comes in multiple colors but lacks the roomy pockets and organizer pouches of the others. *Circle 485 on reader service card.*



Samsonite Sideload Case (\$140.00), PORT Standard Case (\$99.00)

Thankfully, not all laptop cases require you to wrestle with flaps and straps to remove your machine. Simply open up the side compartment on the Sideload Case from Samsonite (800-262-8282 for a retailer near you) and slide the laptop into its padded berth. The Sideload also offers some briefcase-style pouches, but not much in the way of pockets for your disks, PC Cards, and other accessories. *Circle 484 on reader service card.* PORT (800-242-3133, 203-852-1102), meanwhile, has instituted a from-the-ground-up design in the bags it manufactures for Apple and IBM. The solid sidewall construction protects your laptop from bumps and thumps on all sides, and the machine is cradled by a U-shaped sling that keeps your laptop from banging against the bottom of the case. A sturdy strap with an offset shoulder pad completes the picture. *Circle 483 on reader service card.*



Targus Sherpa (\$180), Boyt Walk'n Office (\$495.00)

The Sherpa, from Targus (800-390-4622, 714-523-5429), like its Himalayan namesake, is big and can carry lots of stuff over rough terrain. Combining all of the features of a roll-about carry-on and a laptop case, the Sherpa even comes with a smaller laptop bag inside, so you don't have to lug the whole thing from your hotel to your meeting. *Circle 485 on reader service card.* The Walk'n Office, from Boyt Co. (800-366-2698, 515-848-4626), is also aptly named. Like the Sherpa, it's a sturdy suitcase with wheels and a retractable handle. Inside, the separate laptop bag sits on a solid shelf of its own, well-protected on all sides, while the other compartment easily accommodates a portable printer and other accessories. *Circle 479 on reader service card.*

—David R. Lambert

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(13.2" viewable image)



15 INCHES

AcerView 56E
(13.8" viewable image)



17 INCHES

AcerView 76ie
(15.7" viewable image)



21 INCHES

AcerView 98i
(19.7" viewable image)

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CIRCLE 034 ON READER SERVICE CARD

(Sony Electronics Inc., San Jose, CA; 800-352-7669, 408-432-0190; <http://www.sony.com>. Circle 478 on reader service card.)

The **Panasonic KXL-D745** (\$599 list) comes with a Type II sound/CD-ROM interface card and a combination SCSI and audio cable. A pair of small speakers is mounted in the rear corners of the unit; while their fidelity is limited, their usefulness on a business trip is considerable. This unit runs on six AA batteries or a battery pack.

Performance here, too, is adequate. The Panasonic placed in the middle of the trio of tested 4X drives on the CD-ROM WinMark 96 suite (348 KBps) and Access Time test (381 ms). It trailed the others on the Microsoft Office Installation test (4:04) and File Copy test (4:42), but not alarmingly so. Do note that the Panasonic drive is not for everyone. Because its sound support is built in, we had trouble getting around resource and IRQ conflicts when hooking it to a portable PC that already had a sound card. In a mute portable, though, Windows 95 installation is effortless. (Panasonic Computer Peripherals, Secaucus, NJ; 800-742-8086, 201-348-7000; <http://www.panasonic.com>. Circle 477 on reader service card.)

The screamer of this trio is the **CMS Platinum Portable** (\$399 list) from CMS Enhancements. The drive performed noticeably better than its rival units on our test suite, in large measure thanks to its 256K buffer. It turned in a score of 390 KBps on our CD-ROM WinMark 96 suite and had an impressive showing on the Access Time test: 244 ms, one of the best times we've seen for any 4X drive. It took the Platinum Portable just 3:33 to complete the Microsoft Office Installation test, and 3:52 for the File Copy test.

Our only complaint is that it appears some corners have been cut to deliver a drive this fast at this price point: The Platinum Portable has no display to tell you tracks, times, or modes, and the drive lid doesn't feel as solid as the others. (CMS Enhancements Inc., Anaheim, CA; 800-327-5773, 714-517-0915. Circle 476 on reader service card.)

If you need both a CD-ROM drive and speakers with you for mobile presentations, consider the **Altec Lansing AMC-2800** (\$399 list). This portable multimedia cen-



The Panasonic, Sony, and CMS portable CD-ROM drives, along with portable speakers from Altec Lansing and Cambridge SoundWorks.

ter delivers a claimed 8X CD-ROM player, a 4.5-watt amplifier, and four speakers mounted in the front corners of a solid 12-by-9-by-2-inch box that weighs about 5 pounds. The rear panel has jacks for line in, line out, microphone in, subwoofer out, and headphones. It requires a Type II PC Card slot for the CD-ROM drive, and your laptop must have a sound card to drive the speakers. The sound from the speakers was ideal for a conference-room setting, with little noticeable distortion even at high volumes.

Based on a Philips mechanism, the drive was faster than the portable 4X units on our tests, though as with some other 8X units we've tested, we suspect this is not Philips' true 8X mechanism but rather a spun-up 4X drive. It scored 409 KBps on our CD-ROM WinMark 96 suite—only 5 percent faster than the CMS 4X unit. Its 250-ms score on the Access Time test was a little behind the CMS portable, and it beat the CMS by only a second on the Microsoft Office Installation test (3:32). Still, the combination of utility and solid performance makes this unique product worthy of an Editors' Choice.

If all you need are speakers for a group gathered around a conference table, Altec Lansing offers the **ACS-20** (\$99 list). This small unit (2 by 8 by 5 inches) has two speakers that unfold from an integral mounting bar, with a small bass-reflex port centered between. A pair of buttons on the bar raise and lower the volume, and there's even a jack for an external subwoofer. This tiny array will not produce concert-hall realism, but it does a

surprisingly good job of creating mildly spacious and acceptable sound. (Altec Lansing Technologies Inc., Milford, PA; 800-648-6663, 717-296-2818; <http://www.altecmm.com>. Circle 474 on reader service card.)

Throughout the audiophile world, Henry Kloss has been a name to conjure by for more than 30 years, and most recently he has turned his attention to designing speaker systems for the computer user. The \$219.99 **SoundWorks** set, by Cambridge SoundWorks, consists of two cubical satellite speakers (roughly 3.5 inches a side) and a larger (9-by-8-by-5-inch) vented subwoofer that also contains the three amplifiers. The satellite amplifiers are rated at 4 watts each and the subwoofer amplifier at 10 watts, with less than 1 percent distortion over their respective ranges. For traveling, Cambridge offers a 12-volt rechargeable battery (\$69.99 list) and a \$49.99 tote bag. The musical power of SoundWorks is more than enough to fill a large conference or seminar room, and the fidelity is very close to that of a good home stereo system. The bass is particularly impressive.

For auditorium-filling portable sound, consider the **Cambridge SoundWorks Model Twelve** (\$800). It comes in a sturdy hard-sided case that doubles as a subwoofer, is small enough to fit under an airline seat, and contains a pair of two-way satellite speakers and a three-channel amplifier. Add a portable CD player (there's room in the case) and up to two additional auxiliary sources and you have a transportable audio system that will meet the demands of a true audiophile.

Bass reproduction was powerful and undistorted—even down to the organ pedal point that introduces Strauss's *Also sprach Zarathustra* (the theme from *2001: A Space Odyssey* to you and me). No less impressive was the extraordinary smoothness of the frequency response of the satellite units. The Cambridge SoundWorks Model Twelve is unquestionably the finest computer-related sound system we have yet heard, and its portability makes this Editors' Choice winner that much more attractive. (Cambridge SoundWorks Inc., Newton, MA; 800-367-4434, 617-332-5936; <http://www.hifi.com>. Circle 475 on reader service card.)—Craig L. Stark □

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REMOTE-CONTROL SOFTWARE

Friendly Takeovers

The new crop of Windows 95 remote-control packages boasts multitasking, ease of use, and fast performance. But do they deliver?



One if by LAN. Two if by modem. And now, three if by Internet. There are a number of ways users can gain control of information stored on their office PCs from across the building, on the road, or on the other side of the world. Accessing the data or applications stored on a PC or the corporate network from another PC over some type of communication link is known as *remote access*.

Road warriors and sales reps alike need remote access to keep in touch with the main office as part of their daily activities. But more and more stationary desk dwellers want to be able to work from home after hours or in the event of foul weather, and they want to be able to access their office data and applications quickly and easily.

Today remote access is accomplished two ways: remote control and remote node. *Remote control* allows a remote client PC to take over another PC, called the host, over an analog dial-up, LAN, or Internet connection. The host can be either

By Padraic Boyle

Remote Access Options: Getting There from Here

	Remote control	Remote node	Single-purpose remote application
How it works	The remote PC controls a standalone or networked PC. The program sends screen information, keystrokes, and files across the communications link.	The remote PC sends network-protocol information across the communications link to a PC, bridge, or router connected to the LAN.	The remote PC connects to a special-purpose server designed to automate specific tasks, such as e-mail or sales-data retrieval.
Typical uses	To transfer files or to run applications remotely.	To access network files and services.	To give automated access to e-mail or custom applications.
Pros	Needs just a low-end PC and modem.	Allows access to all network services.	Provides fast and efficient access.
Cons	Requires a different style of software use.	Requires a more powerful remote PC than simple remote control.	Allows use of only a single application.
PRODUCTS AND SOLUTIONS			
PC to PC	Software designed for a single user calling to a desktop PC, including the products in our main roundup.	Software-based remote-node servers for desktop PCs; included with OS/2 Warp Connect and Windows NT Workstation.	None: These products are designed for a client/server setup.
PC to server	Software that allows multiple remote-control sessions on the same PC server, such as Citrix's WinFrame.	Software that resides on an existing file server, such as Novell's NetWare Connect, Windows NT's Remote Access Services (RAS), and third-party products.	Software that provides specific remote-access services, such as the replication features of Lotus Notes and Microsoft Exchange, or middleware from MobileWare and XcelleNet.
PC to dedicated server	Server systems with multiple PCs on boards that run remote-control software. Vendors include ChatCom (formerly J&L Information Systems), CommVision, Cubix, and Evergreen Systems.	Remote-node server vendors include Cisco, Digi, Microcom, Shiva, 3Com, and U.S. Robotics. Each can use the Windows 95 remote-node client, and each offers a variety of connection options.	Most application-specific products allow use over remote-node servers.

a standalone desktop PC or a PC on a network. The remote client takes control of the host PC's CPU, screen, and keyboard and runs applications on the host or transfers files between the host and client.

Since most processing is done by the host, remote control is great for accessing large network databases and executing applications that your remote client lacks the

power or local storage space to run.

Remote control is also increasingly used as a vehicle for technical support and training. Several PC vendors, including Compaq, IBM, NEC, and Dell, are including remote-control client software with their hardware products.

In this roundup we cover seven remote-control packages that work under Windows 95: Microcom's Carbon Copy for Windows, Artisoft's InSync CoSession Remote, Traveling Software's LapLink for Windows 95, Danware Data A/S's NetOp for Windows, Symantec's Norton pcAnywhere32, Stac's ReachOut, and Avalan's Remotely Possible/32. Three of these—pcAnywhere32, LapLink, and Remotely Possible/32 for Windows 95—have 32-bit architectures.

Remote node, by comparison, treats the remote client as an extension of the LAN. Connected over a dial-up PPP connection such as Shiva's LanRover remote-access server, remote-node clients communicate as if they were PCs connected to the office network. Log-on and drive mappings are the same, and most of the processing takes place on the re-

remote client, with transactions and files being sent via modem, ISDN line, or Internet link.

A remote-node connection is especially suited to interactive applications like e-mail, or for pulling files from the network to the remote PC. In a remote-node scenario, multiple users generally share a single point of connection to the network, making management and security more practical than with remote control.

A cross between the two techniques is called *remote control over remote node*, offered with all of the remote-control packages in this review. Remote control over remote node offers users the functionality of remote control but over a centralized point of entry. This helps to cut down on the necessity for every office PC to have a modem, and provides strict security access to the network.

REVIEW CRITERIA

For this review, we looked for remote-control packages that could run as hosts and remote clients under Windows 95. We also required that they be able to perform remote-control tasks directly

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over dial-up lines. Knowing that many organizations have users running operating systems other than Windows 95, we requested that vendors send along their Windows 3.x, Windows NT, and OS/2 products as well.

We tested Windows 95 and NT products for performance and usability. For Windows 3.x products, our main concern was to test the abilities of Windows 3.x-based clients to work with Windows 95 and NT hosts, and vice versa.

Seven products from seven vendors met our criteria. An eighth, Norton-Lambert's Windows 95 version of Close-Up, was not shipping in time for testing.

SUITE DEAL?

Purchasing suites of remote-control products makes sense for departments and organizations alike, since users at most organizations are running a variety of desktop operating systems. In many cases they may have Windows 95 at home and Windows 3.x at work, or Windows 3.x on their laptops and Windows NT Workstation on their office PCs.

All of the vendors' product lines covered Windows 3.x and Windows 95. Two vendors, Avalan and Symantec, offer Windows NT Workstation clients. One vendor, DanWare Data A/S, offers software for Windows 3.x, 95, NT Workstation, and OS/2. We also cover Farallon's Timbuktu, which has a Macintosh client, in the sidebar "Remote Control over the LAN." Timbuktu and Funk Software's WanderLink, an NLM-based remote access package, did not make it into our main review because neither has its own dial-in capability, but both can use Windows 95 Dial-Up Networking. In the sidebar "Remote Control for OS/2" we also review two products, KopyKat and Remote Services Management, that work only on OS/2.

Cross-platform compatibility is great in concept. In our testing, however, we discovered that remote control between a Windows 3.x or 95 client and a Windows NT host, and vice versa, can be downright slow.

TWO FUNCTIONS

The two basic elements of remote-control packages are remote control and file transfer. What distinguishes one product

ReachOut

Speed and security are essential requirements for any remote-control package. Since we were testing Windows 95-compatible products, we were hoping to find a fast and secure remote-control package that also

featured a 32-bit architecture, Windows 95 look and feel, and support for TAPI and Windows 95 Dial-Up Networking. We also hoped for a product suite that offers interoperability among all the major desktop operating systems. We didn't find what we were looking for, so we went back to the essentials.

Stac's ReachOut gets our Editors' Choice for the second year in a row. Version 5.05 is not a full 32-bit product, and it doesn't integrate with Windows 95 as well as LapLink for Windows 95 or pcAnywhere32 do. But ReachOut's top-notch performance and tight security still make it the best choice for organizations using Windows 3.x and Windows 95 PCs. By the time you read this, Stac plans to have shipped ReachOut 6.0, which promises interface and performance enhancements.

An honorable mention goes to LapLink for Windows 95, which has excellent Windows 95 integration and basic security, although it doesn't match the performance of ReachOut 5.05. LapLink also has a multiprotocol host mode that can answer a call regardless of connection type.

from another are the features and functionality of each element.

Among the features we saw for improving remote-control performance were wallpaper suppression, screen sizing, and color scaling. *Wallpaper suppression* speeds performance by disabling the background graphical wallpaper on the

For Windows NT Workstation users, we suggest you see our reviews of Norton pcAnywhere32 and Remotely Possible/32. The former has impressive features, good security, and excellent file-transfer performance, while the latter offers better remote-control performance and features such as role reversal and multiple host and viewer connections for technical support and training.

Organizations looking for a suite that covers Windows and OS/2 have one choice—NetOp, from DanWare Data A/S. Unfortunately, NetOp's features were minimal and its performance was extremely poor. If Macintosh users are part of your mix, look at Farallon's Timbuktu Pro for Networks, which provides cross-platform remote control between Windows PCs and Macs.

We were impressed with the remote-control speed and management features of Citrix's WinFrame, which provides multiple user sessions on a Windows NT Server. Though as a server-based solution it wasn't part of our main roundup, WinFrame was one of the best products we looked at for providing many users with remote access to shared applications and files.



host's Windows 3.x or Windows 95 screen, thereby avoiding the transmission of a large, relatively useless bitmap across a slow modem connection.

Screen sizing, implemented by Carbon Copy, LapLink, and pcAnywhere32, handles the problem of hosts and clients with different screen resolutions by fitting the

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HIGHLIGHTS

Remote-Control Software

Remote access, by its very nature, will never be as easy as we'd like it to be. Conceptually, it requires us to imagine ourselves in two places at once, and practically, we can't always control the availability of our host PC or server. Our review of remote-control products, however, shows that they've made great strides in improving speed, cross-platform support, and overall ease of use to make your remote resources seem very close at hand.

Speed enhancements to many of these products let you get to your desktop and access files faster than ever before. Products include better compression algorithms for reducing file-transfer time, and every product we reviewed (except NetOp) now includes a delta-file-transfer feature, which transfers only the parts of a file that have changed. But while some packages have improved remote-control performance, others have actually decreased their overall remote-control speed and usability.

The Internet—you simply can't get away from it—is being touted as a great wide-area network for remotely accessing a desktop PC. Because all remote-control software packages now support TCP/IP to some extent, the logical progression is to use them over the Internet. But as with any communications over the Internet, you may not feel comfortable sending private information over an unsecured, public network. And despite security features such as encryption and password protection, you may not want to expose your corporate LAN to a hacker who might download a trial copy of the remote-control software you're using.

host display into the remote screen so you don't have to scroll around. This feature sounds great in theory, but we found it pretty tough to read screens that had been scaled down.

Color scaling, a feature offered by pcAnywhere32, lets you choose a reduced number of colors for your remote-control session. LapLink for Windows 95 can color-scale automatically.

Another useful remote utility, printer redirection, lets you print files stored on the host to a printer on the remote client. This feature was offered by five of the products we tested.

File transfer is another popular function of remote control. Among the standard features that should be included are drag-and-drop copying; delta-file transfer, in which only changed portions of a file are transferred; long filename support; and directory synchronization, in which the software makes sure the most up-to-date files are on both machines. Other useful file-transfer features include virus protection during copy, file transfer recovery in the event the link is broken, and file compression for added speed.

To add some value to their remote-control products for training and techni-

cal support, LapLink and Remotely Possible/32 offer a feature known as *role reversal*. This allows the host and client to change occupations without having to disconnect from one another. Moreover, these vendors offer connections from multiple clients or to multiple hosts simultaneously.

32-BIT PERFORMANCE?

New in this year's roundup are three 32-bit products: pcAnywhere32, LapLink for Windows 95, and Remotely Possible/32 for Windows 95. Each of these products attempts to capitalize on Windows 95's look and feel, with features like drag-and-drop file transfer and multitasking, and support for Windows 95 Dial-Up Networking, TAPI (Telephony API), and Unimodem.

Windows 95 Dial-Up Networking, a remote-node utility included with Windows 95, lets you dial in to any Windows NT Server running the built-in Remote Access Service (RAS) or any other PPP remote-node server, such as Shiva's LanRover. All of the remote-control packages in this roundup let you dial in to the network with Dial-Up Networking and run a remote-control session over the

Remote-control products have improved their **Windows 95 integration**, making them even easier to use. Some have added support for TAPI, long filenames, Windows 95's Dial-Up Networking, and the ability to drag connection icons onto the desktop. Another important feature, especially for networked PCs, is the ability to load before the Windows 95 log-on screen appears.

Another noticeable trend was **multiplatform support**. Vendors are providing suites of products for every platform that companies are using today—including DOS, Macintosh, OS/2 Warp Connect, Windows 3.x, Windows 95, and Windows NT Workstation. While none of the product families we looked at provided this entire range, you'll find products to support almost any remote-control need. We discovered, however, that performance was sometimes dismally slow between products on different platforms.

Windows NT Workstation products were not what we'd hoped for. Two that we looked at—NetOp for Windows NT and pcAnywhere32 for Windows NT—had remote-control performance that was well below that of their Windows 95 counterparts. The third, Remotely Possible/32 for Windows NT, did not include a dialer, making it necessary to use Windows NT Remote Access Service (RAS) for desktop-to-desktop remote connections. We expect to see a whole new wave of Windows NT remote-control products soon after Microsoft ships Windows NT 4.0 this fall.

remote-node connection.

TAPI is a programming interface for creating interactions between your PC and communications devices; it lets multiple applications use the same modem simultaneously. If you've already installed and configured your modem in Windows 95 and your remote-control package supports Unimodem, Windows 95's universal modem driver, you won't have to reconfigure the modem during the remote-control package installation.

We were surprised to find that 32-bit products did not necessarily outperform their 16-bit counterparts. In the case of Windows 95, the most likely reason is that Microsoft still uses a combination of 16- and 32-bit video drivers in Windows 95 to maintain compatibility with older 16-bit applications. Performance of Windows NT products, however, was also disappointing and generally surpassed by that of the 16-bit products. Windows NT remote control is a brand-new category, so look for improvements in the future.

CONTROL OVER THE INTERNET

Since all of these products support TCP/IP, remote control over the Internet is now a possibility. Users can access their

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Citrix's WinFrame: Windows Anywhere

By Steve Rigney

All of the remote-control packages in our main roundup let you set up a single PC with multiple user names and passwords. But most of these products don't let more than one user connect at a time, and none are suitable as multiuser host servers.

Don't panic. There's an alternative to setting up a closet full of PCs for remote control: Citrix Systems' WinFrame, engineered around Microsoft Windows NT Server 3.51, gives multiple remote users simultaneous control of a single PC. Unlike traditional remote-control software installed on multiple PCs on your LAN, WinFrame features centralized management and security, providing extensive control of what each user can access.

Multiple DOS, Windows 3.x, Windows 95, or Windows NT Workstation client PCs can access a WinFrame server simultaneously and run applications located on the server or on the local network. Since WinFrame runs as an extension to Windows NT Server, you get all of the benefits of that OS, including error and event logging, support for Windows applications, and built-in symmetric multiprocessing (SMP) support. WinFrame—which requires a 486-based PC server or better with 16MB of RAM (plus 4MB of RAM per concurrent Windows client) and 200MB of hard disk space—is extremely easy to install, and the well-written documentation will help you if you encounter a problem.

We looked at WinFrame/Access (\$2,995 for 10 concurrent users; additional 5-user licenses are available for \$995), which allows asynchronous dial-up connections. For larger sites, Citrix sells WinFrame/Enterprise (\$5,995 for 15 concurrent users; \$995 for an additional 5), which in addition to dial-up connections allows LAN, WAN, and Internet connections. Citrix says WinFrame can sustain 15 concurrent users per processor, so a six-processor system could support as many as 90 sessions.

Citrix adds two major enhancements to the Windows NT operating system: the Intelligent Console Architecture (ICA) Windows presentation services protocol, and the MultiWin multiuser architecture.

Citrix's ICA protocol, which is similar to the Unix X Window protocol, allows the remote user's interface to run with minimum resources on the client PC. This lets even a 286-based DOS PC run large, resource-intensive applications across analog phone lines. During our testing, we

found performance was even better than that of traditional remote-control packages. ICA runs over most network protocols, including TCP/IP, IPX/SPX, NetBEUI, and the Point-to-Point Protocol (PPP).

MultiWin is Citrix's technology that turns Windows NT into a multiuser OS. With MultiWin, multiple remote users can run the same application simultaneously on the WinFrame server. (Citrix recommends purchasing LAN-licensed versions of any applications you run on WinFrame.) Each application runs in its own virtual session, so if a user's session crashes it won't affect other users or applications on the server.

The lightweight ICA protocols make WinFrame ideal for low-bandwidth Internet connections. Unlike Java and similar technologies, ICA transmits no executable code—

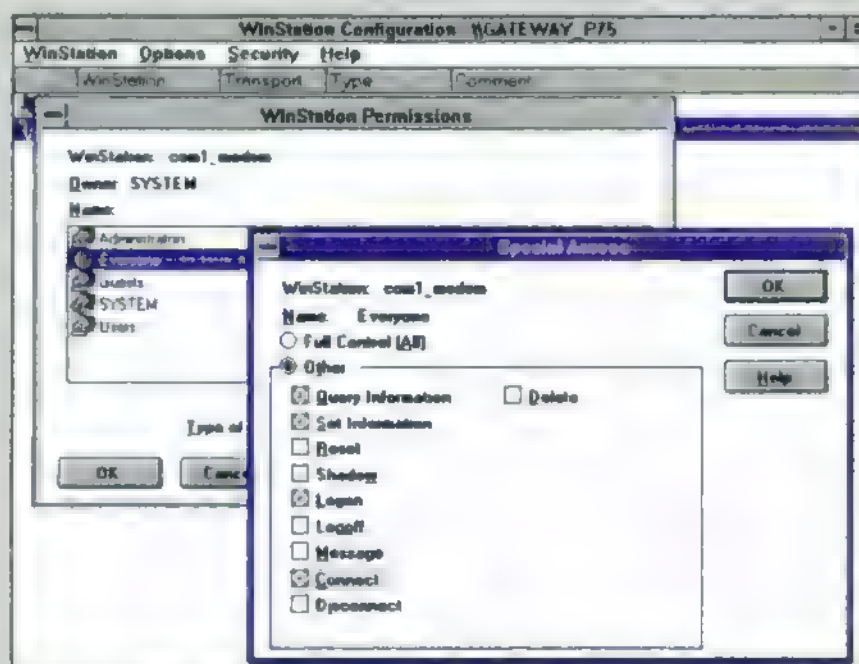
only screen, mouse, and key-stroke information. Citrix is partnering with TransPhone, which is planning to offer a device that will integrate a phone, an answering machine, and an ICA-based Windows terminal. These low-powered terminals, expected to begin shipping by the end of the summer for about \$500, will allow you to connect over a modem or ISDN adapter to a WinFrame server connected to the Internet. On the downside, you might have no choice of Internet service providers, since the one you

use must be running WinFrame.

Other Citrix partners include Wyse Technology, which sells Winterm, a \$500 Windows terminal device with a network connection, and Zenith Data Systems, which uses WinFrame as part of its MultiCruise wireless LAN systems.

Unlike many remote-control applications, WinFrame gives you complete control over what remote users can do on the desktop. WinFrame allows you to limit a user to a single application on the server. An administrator can even set up an icon on the remote user's PC that will initiate the connection and run only that remote application as if it were stored locally. When users connect to a WinFrame server, they also have complete access to their local resources. They can choose to print to local or remote printers, map remote drive letters, and even cut and paste data between local and remote applications.

WinFrame/Access. List price: 10-user license, \$2,995. Citrix Systems Inc., Coral Springs, FL; 800-437-7503, 954-755-0559; <http://www.citrix.com>. Circle 493 on reader service card.



WinFrame lets you set detailed rights for each user or group, including which directories users may access.

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REMOTE-CONTROL SOFTWARE

How to Read the Suitability to Task Boxes

Setup and configuration We consider ease of program installation and configuration of basic connection and security options. We look for packages that integrate with Windows 95 Dial-Up Networking and Microsoft's TAPI specification, and we give extra credit to those that provide a single interface combining host and client functions.

Remote control We want programs that redraw screen elements clearly and let users disable host wallpaper and screen savers for better performance. We also look for remote-drive mapping, printer redirection, multiple screen-resolution options, screen scaling, and screen caching during and between sessions. We like products that include scripting features for automated connections.

File transfer We look for long filename support and the ability to drag and drop

SUITABILITY TO TASK

Product name	
Setup and configuration	Poor
Remote control	Fair
File transfer	Good
Management and security	Excellent

files from the host to the remote PC. The product should be able to resume a file transfer where it left off after a disrupted session. We expect directory and file synchronization and a delta-file feature that transfers only changes within a file for faster performance. We prefer products that provide a directory-structure interface that allows file tagging, as well as the option to notify the user if the program is overwriting files.

Management and security As a bare minimum, products must support host and user security profiles. We evaluate other typical options, such as disabling keyboard input, blanking the screen, and rebooting the host PC. The product's management features should let you grant users read-only or read/write privileges. We also want to be able to restrict user access at the drive, directory, and file levels. We consider options for setting password expiration dates and session time limits. The best products also offer data encryption, virus protection, intruder detection, and extensive audit-logging features by session and by user.

office computers from local ISP accounts anywhere in the world, saving on long distance charges and providing a single point of security through the network firewall.

Remote control over the Internet has its stumbling blocks, however. For example, in order to connect to another PC over the Internet, you must know its TCP/IP address. Unfortunately, if the host PC normally accesses the Internet via an online service or a modem connection to an Internet service provider, it may be allocated a different TCP/IP address with each session.

Traveling Software attempts to help LapLink users with this problem by providing its own WINS server on the Internet, letting you find other PCs registered on the same WINS server.

Be aware, also, that your network manager may have to reconfigure the firewall to let remote connections through, and you run the risk of other users sniffing out your log-on and password over the Internet. You may want to choose a package that offers encryption, such as Co-Session for Windows, pcAnywhere32, or ReachOut, or Remotely Possible/32, if you will be using this feature.

SECURITY

Each of these remote-control packages provided the basic log-on name and password features to keep out unwanted users. Other options included limits on session time and password retries. Rebooting the host after log-off is one of the

oldest and most useful ways of securing your system between sessions.

Five products went several steps further and added intruder detection, which keeps logs of access and freezes the system after a user-definable number of unsuccessful log-on tries. Moreover, four products were capable of encrypting data being sent over the wire, including log-on name and password.

All of the vendors in this review, including the 16-bit applications, plan on newer revisions due this fall to support Microsoft's Windows NT 4.0 release.

Microcom Inc.

Carbon Copy for Windows

Carbon Copy for Windows, Version 3.0, is an average solution for remote access. All of the basics are here, and

Microcom provides interoperable clients and hosts for DOS, Windows 3.x, and Windows 95. But while Carbon Copy (\$129) posted good overall results on our performance tests, we found that its lack of support for long filenames, TAPI, and Windows 95 Dial-Up Networking made it less

than ideal for Windows 95 remote control.

Carbon Copy is a 16-bit program that allows any Windows 3.x or Windows 95 client computer to control a host remotely on either platform. Carbon Copy for DOS 7.0 (\$129) can also communicate with its Windows-based brethren. Since our last review, Carbon Copy has added many new features, including drive sharing, remote printing, and a Netscape Navigator plug-in feature for remote control over the Internet (downloadable from Microcom's Web page). A 32-bit release of Carbon Copy, due out in the fall, will work with Windows 95 and Windows NT Workstation 4.0. Microcom says the product will have a Win-

SUITABILITY TO TASK

Carbon Copy for Windows

Setup and configuration	Fair
Remote control	Good
File transfer	Good
Management and security	Good



Carbon Copy for Windows puts frequently used features on large, easy-to-use buttons.

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Remote Node: The Other Remote Access

By Steve Rigney

If you need to connect to your office PC and run large client- or server-based applications, you'll want to use one of the remote-control packages in our main roundup. But if you need access to all of the network's resources, remote node may be a better solution.

Unlike the remote-control products we reviewed, remote-node products let you log on to a remote network using one or more network protocols, such as IPX or TCP/IP. Applications reside on the remote client, and network traffic passes between the remote PC and the network instead of screen and keystroke information as in the remote-control model.

Hardware-based remote-node servers include Cisco's Access Servers, Microcom's LANexpress, Shiva's LanRover, and 3Com's AccessBuilder. Network operating systems can act as remote-node servers, too, with products such as Novell's NetWare Connect, OS/2 Warp Server's built-in Remote Connection Service, and Windows NT Server's built-in Remote Access Service.

ISDN AND BEYOND

One of the most exciting new developments in remote node is the introduction of ISDN adapters. Even with a fairly fast 28.8-Kbps modem, launching a large application or transferring a large file using a remote-node connection can take a long time. Vendors such as Microcom and Shiva now offer ISDN adapters in their remote-node product lines. Some of these, including the Shiva LanRover Plus, work with the Multilink PPP (MP) standard, which allows you to establish 128-Kbps connections. While still slower than a direct LAN connection, ISDN should be acceptable for most applications.

While ISDN is the newest connection type available in remote-node products, vendors are looking at newer, even faster technologies. Some of the new connection types you might see in the future are cable modem, Asymmetrical Digital Subscriber Line, and wireless. (For more information, see "Fast Connections," June 11, 1996.) As speeds increase, you will be able to perform all of your office tasks from your home or from the road.

Until everyone gets a fast connection such as ISDN, remote control is still the best solution for running server-based applications. Fortunately, most remote-control solutions will work over a remote-node connection (see "Remote Control over the LAN" in this story), allowing you to use a single phone call to run server-based applica-

tions and to perform remote-node tasks such as checking e-mail or accessing the company intranet.

REMOTE NODE ON THE INTERNET

These new and faster connection methods and the ability to work with multiple network protocols, including TCP/IP, are making remote-node products popular with Internet service providers. These products also offer strong security and management capabilities that make it easier to keep track of users. Netscape has even included Shiva's client software in its Netscape Navigator Personal Edition to connect to an Internet service provider via a PPP dial-up connection.

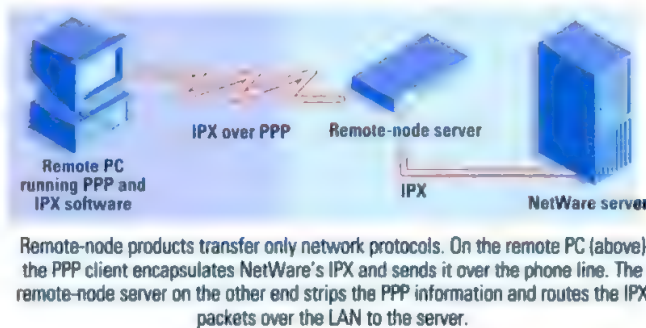
The multiprotocol features of these remote-node products also make them ideal solutions for simultaneously accessing the company network and the Internet. For example, you can use the IPX protocol to connect to the NetWare file server at your office and, during the same session, use TCP/IP to surf the Internet using the company's router. If you are concerned about tying up your company's Internet connection, several products let managers limit users to a single protocol and limit access time.

Microsoft and U.S. Robotics have developed a new protocol for remote

node called the Point-to-Point Tunneling Protocol (PPTP). PPTP, which will be included in the next release of Windows NT, is designed to make it easier to connect your remote PCs to the network using existing infrastructures such as the Internet. PPTP allows you to keep your PPP connection all the way to the server, as opposed to terminating it at the remote-node server. This means that you can use the security and features of Windows NT Server to manage remote users. U.S. Robotics is the only vendor currently offering a product that works with PPTP, but such vendors as Microcom and Shiva plan to add it to their servers.

CACHING UTILITIES

Products known as *remote-node accelerators* can significantly increase remote-node performance. Software on the remote client redirects file-system calls to the server agent on the LAN. The server agent intercepts and caches redundant file-system calls between the file server and the clients. The client agent then determines the fastest way to access data, using the dial-up bandwidth more effectively. Remote-node accelerators include AirSoft's Powerburst and Measurement Technologies' Shared LAN Cache.



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dows 95 look and feel, include TAPI support, and be able to host multiple simultaneous connections.

With good performance on our tests, Carbon Copy fell only slightly behind Remotely Possible/32 on Windows 95 on our remote-control test script. On our delta file-transfer test Carbon Copy also came in second, just shy of ReachOut.

Carbon Copy supports communications over a modem; IPX, NetBIOS, and TCP/IP network protocols; an asynchronous communications server; or a serial cable (not included). An ISDN add-on module is available free from Microcom's Web site. For remote control over remote node, Carbon Copy offers a mail-in coupon for a free, full-featured PPP dialer for remote-node connections. But although it's free, like Stac, Microcom charges you for shipping and handling. And Carbon Copy does not support Windows 95 Dial-Up Networking, so you must use the Shiva PPP dialer even under Windows 95.

The main interface of Carbon Copy's Windows client consists of eight large buttons that set up Carbon Copy for remote control, file transfer, chat, drive sharing, clipboard transfer, remote printing, dialing a host, or waiting for a call in host mode. Of the products we reviewed, Carbon Copy was one of only two (the other was ReachOut 5.05) that offered two-way drive mapping, which gives the host and viewer access to each other's drives. But unlike several of the other packages, Carbon Copy does not offer a role-reversal feature to give the host control of the remote PC.

Setup was simple: Using a slew of wizards, Carbon Copy walks you step-by-step through installation and configuration. Although it lacks TAPI support, Carbon Copy automatically detects each communications port and configures the modem.

Carbon Copy's viewer interface lets the remote client set viewing options, such as disabling the host PC's wallpaper. If the host screen has a higher resolution, Carbon Copy lets you use either Auto-Panning, which moves the screen with the mouse, or Windowed mode, which uses scroll bars. Another option lets you shrink the host screen to fit within yours, but this makes the screen harder to read and slows down performance,

so you'll want to stick with one of the other options.

The file-transfer interface looks similar to the Windows 3.x File Manager. Carbon Copy lets you drag and drop files and directories between local and remote PCs, as well as synchronize directories, and includes a crash-recovery feature if the transfer is interrupted. New in this version is delta-file transfer, which can be automated using Carbon Copy's extensive scripting language. But Carbon Copy does not offer support for long filenames and provides no virus scanning, as do pcAnywhere32 and ReachOut.

Security features are a mixed bag. In addition to the usual user name and password options, Carbon Copy lets you set the maximum number of log-in attempts, session time, and access to services for each user. Also, Carbon Copy lets you password-protect directories and files, a feature that only CoSession also supports. Host confirmation using Caller ID and remote dial-back are also available, and you can password-protect the program so that users can't change settings. But Carbon Copy lacks data encryption, which is important when communicating over unsecured networks such as the Internet. An optional audit log stores remote-access activity, but it's not very informative and does not provide unauthorized-access alerting.

Carbon Copy provides a plug-in for Netscape Navigator 2.0 that lets you remotely control other Carbon Copy hosts through the Web browser. We didn't find this feature particularly useful. The plug-in does not let you password-protect your host, and you need to know the host's IP address, which is difficult if the host is connected via an Internet service provider. Microcom does not provide a WINS server for its customers, as Traveling Software does for LapLink users. Also, if you have a firewall protecting your corporate LAN, you'll have to modify its configuration to allow Carbon Copy to access the network—a potential security breach.—*Padraic Boyle*

Carbon Copy 3.0 for Windows. List price: \$129. Microcom Inc., Norwood, MA; 800-822-8224, 617-551-1000; fax, 617-551-1021; <http://www.microcom.com>. Circle 486 on reader service card.

Artisoft Inc.

InSync CoSession Remote

Despite some shortcomings and average performance, InSync CoSession Remote (\$79 list price for two-user pack) provides acceptable remote-control and file-transfer features for Windows 3.x and Windows 95, at the lowest price of the products we reviewed. InSync CoSession Remote—formerly a product of Triton Technologies, purchased by Artisoft earlier this year—runs over analog modem, ISDN, LAN, and the Internet.

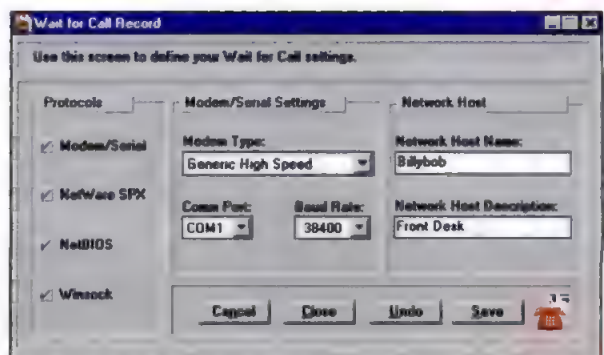
Although a 16-bit application, CoSession operates well under both Windows 3.x and Windows 95, and offers the same interface for each but with a slight difference in security features. A separate product, InSync CoSession Remote for DOS (also \$79), lets DOS machines control Windows 3.x and Windows 95 machines running CoSession.

CoSession showed average performance

SUITABILITY TO TASK

InSync CoSession Remote

Setup and configuration	Fair
Remote control	Fair
File transfer	Good
Management and security	Good



CoSession, like LapLink and Remotely Possible/32, lets you set the host PC to wait for any call, whether over a network or modem.

on most of our tests, and though its general remote-control performance was below average, subjectively it was not particularly slow to work with. We found that performance over the network was considerably slower than that of any other product, however.

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Remote Control for OS/2

By Steve Rigney

Although we focus on Windows 95 solutions in the main story, you might also need to provide remote control for IBM's OS/2 Warp. We looked at two of the most popular remote-control solutions for OS/2: Hilgraeve's KopyKat and International Software Solutions' Remote Services Management (RSM), formerly called PolyPM/2. These two products have very different capabilities and features, but both come only with OS/2 viewers and give you remote control of a PC running OS/2. DanWare Data A/S's NetOp, reviewed in our main roundup, also provides remote control for OS/2 that works with the company's Windows remote control viewers.

KOPYKAT

KopyKat is a very basic but easy-to-use remote-control package. The OS/2-only package operates over a dial-up modem, serial-cable, ISDN, Internet, or network connection. The new Version 1.21 of the product (\$199 for two users) adds support for the IPX/SPX network protocol to its support for TCP/IP and NetBIOS.

The program comes on a single floppy disk and requires less than 5 minutes to install. If your PC is going to be the host PC, you need only install the Kat application; the Kopy program allows you to control the host from another PC.

While KopyKat doesn't have a chat utility, it does offer a fairly nice file-transfer application. Unlike some file-transfer utilities that blindly copy files, KopyKat looks for the same filename in the destination directory and gives you the option of renaming, deleting, or overwriting the file. Unfortunately, KopyKat doesn't provide a file-synchronization utility. A nice feature of the file-transfer program is crash recovery: If a file transfer is canceled, KopyKat will make another attempt to transfer the file during the next connection.

If you are going to connect from home or the road, you'll like KopyKat's

extensive list of about 450 modem strings, including ISDN adapters. You can also run multiple instances of the program to control several PCs simultaneously, which is feasible only across a LAN unless you have multiple modems connected to your PC.

KopyKat has good remote-control and file-transfer performance and is extremely easy to use. But KopyKat's



KopyKat includes basic security options for OS/2-to-OS/2 remote control and file transfer.

security is limited to user names and passwords; it lacks the more extensive security features offered by Remote Services Management.

KopyKat. List price: 2-user version, \$199. Hilgraeve Inc., 800-826-2760, 313-243-0576; <http://www.hilgraeve.com>. *Circle 494 on reader service card.*

REMOTE SERVICES MANAGEMENT

RSM is designed for installations running multiple operating systems across multiple network segments. Although the product is fairly easy to use, you will need to spend a few days setting up the gateways, manager software, and clients where you want them. But if you need remote control for a medium-to-large network and you're running OS/2, RSM is a good solution. Developed by International Software Solutions, based in France, RSM is sold in the U.S. by Software Corp. of America.

RSM comes in three versions: Lite, Advanced, and Professional. Each version offers different utilities and capabilities. But, unlike KopyKat, all of the versions allow you to control DOS,

OS/2, or Windows PCs from a remote OS/2-based client. The Professional version (\$1,380 for a five-user license), which we tested, offers the most features, including a dial-in gateway, high-speed connectivity, strong security, and a powerful scripting language.

You can use RSM's manager software to connect to the host using a modem, ISDN, X.25, or a network connection running IPX, NetBIOS, or TCP/IP. The client gateway software allows you to connect to a dedicated DOS, OS/2, or Windows-based PC and control any PC on the LAN that's running the client software. You can even use the manager gateway to link multiple remote networks across a WAN using almost any connection method.

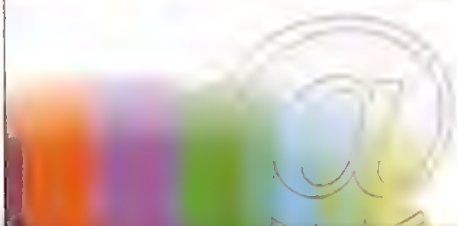
Along with standard features such as chat and file transfer, RSM includes a useful Marker utility. Marker mode allows you to use a virtual marking pen at the remote client to select, circle, or underline anything on the host's screen. RSM lacks delta file transfer and file synchronization, but it can transfer files based on both HPFS and FAT file systems, and it can automatically disconnect at the end of a file-transfer session.

Security features are excellent. In addition to providing basic security, such as user names and passwords, RSM allows you to limit access to specific files and limit the length of time users can connect. The RSM Journal can keep an audit trail of when each user connected and for how long. RSM also uses data encryption and a call-back feature.

Remote Services Management's powerful Programming Script Language (PSL), included only in the Professional version, is fairly complex. If you take the time to learn it, you can create automated tasks, such as software distribution and inventory.

Remote Services Management. List price: 5-user Professional version, \$1,380. Software Corp. of America, 800-966-7722, 203-359-2773. *Circle 495 on reader service card.*

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IMATION

Born of 3M Innovation

We found the product easy to install and configure, even though CoSession does not support Windows 95's TAPI. The installation program offers a fairly comprehensive list of modems, and once you've configured the modem, CoSession is ready to go. CoSession let us easily set up and configure both the remote and host computers.

You start CoSession by choosing either the Host or Viewer program. Each program brings up a screen with a series of buttons designating various functions including call, wait for call, remote control, chat, and file transfer. Clicking on each button brings up the appropriate dialog box.

The file-transfer utility looks and feels like Windows 95 Explorer, complete with drag-and-drop capabilities, and CoSession does support long filenames. Logs can keep track of remote-client connections and file-transfer activity. Along with delta-file-transfer support, CoSession's file transfer utility supports connection recovery, so that if a file transfer is interrupted, the copying process will pick up where it left off. CoSession supports directory syncing—copying only those files that have changed within a directory—and directory cloning, which transfers all files without comparing them.

Similar to LapLink and Remotely Possible/32, CoSession lets you configure the host for Multiprotocol Host Wait mode. This lets the host wait for connections from remote clients whether the connection type is modem or network. But unlike LapLink and Remotely Possible/32, CoSession cannot host multiple concurrent connections.

CoSession does not currently support TAPI, but Artisoft plans to include TAPI support in a version later this year when Windows NT Workstation 4.0 ships. And while Carbon Copy, LapLink, and Norton pcAnywhere32 let you suppress Windows wallpaper to speed up performance over a slower link, CoSession does not. You will probably want to disable your host PC's wallpaper manually if you plan to use CoSession for remote control. CoSession also lacks a scaling feature, which shrinks the host screen to fit into a lower-resolution client screen. Instead CoSession uses scroll bars to navigate the larger host screen.

For best results, Artisoft suggests setting the host and the remote client to the same monitor resolution.

CoSession's security features include the usual user name and password options, and you can set a master password so that users can't modify phone-book settings. But CoSession includes no intruder-detection capabilities to disable the host computer if someone is attempting to hack into the host PC. A log-on notification feature on the host gives the operator of the host PC the option to allow or deny access to the remote user attempting to access the computer. As with Carbon Copy, you can set either global access rights or user-by-user rights for read and write access to directories and files.—PB

InSync CoSession Remote 7.0. List price: \$79. Artisoft Inc., Tucson, AZ; 800-846-9726, 520-670-7100; fax, 520-670-7101; <http://www.artisoft.com>. Circle 487 on reader service card.

Traveling Software Inc.

LapLink for Windows 95

With its excellent Windows 95 integration, LapLink for Windows 95 (\$149) was one of the easiest remote-control and file-transfer products to use. In addition, LapLink for Windows 3.x comes in the same box. But while it includes some attractive features such as simultaneous multiuser connections, the current version of LapLink had average performance results, and it also lacks some important features found in other products, including advanced security, data encryption, virus checking, and session scripting. LapLink is therefore best for single users connecting to their own desktop PCs rather than for connecting to a PC on a network. The next release, due by the time you read this, promises to include a scripting feature and other enhancements.

LapLink's performance was below average overall, though it scored well on the noncompressible File Transfer test and the Delta File test. On our Remote Control test, LapLink for Windows 95 scored somewhat

below average, but in practice its speed was acceptable.

True to its name, LapLink for Windows 95 is a 32-bit application that does a good job of capturing the look and feel of Windows 95. Installation was easy. With support for Windows 95's TAPI, LapLink automatically found our modem. LapLink also queries the computer to see what other connections and protocols are present and enables those as well. Like pcAnywhere32, LapLink's remote-node option links directly into Windows 95's Dial-Up Networking properties.

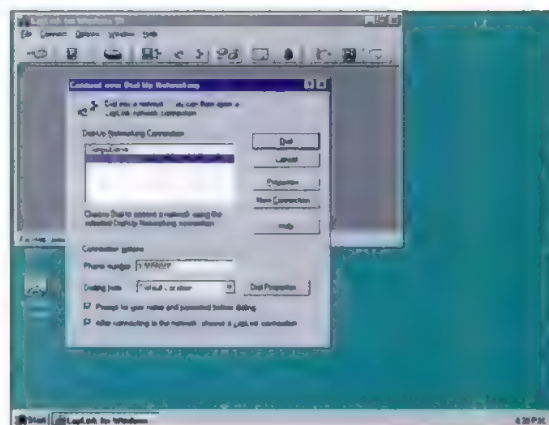
LapLink has one of the most intuitive and usable interfaces of the products we reviewed. You don't have to select a wait-for-call option, as is necessary in every other product; if you've enabled a port in LapLink it's ready to receive or initiate a call. To call a host you simply choose a connection type from the toolbar and fill in the resulting dialog box. LapLink can host as many as 11 simultaneous connections. Of the products we reviewed, only Remotely Possible/32 offers a similar multisession feature.

LapLink for Windows 95 lets you set options for viewing, such as disabling the host wallpaper. For navigating host screens with higher resolution, LapLink lets you use either scroll bars or a screen-scaling feature that shrinks the host screen to fit. As with other screen-scaling implementations, we

SUITABILITY TO TASK

LapLink for Windows 95

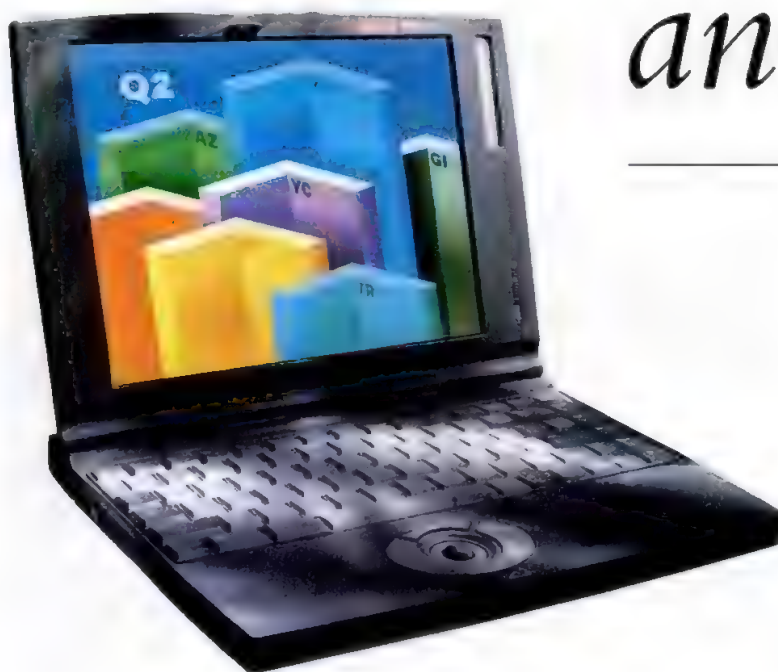
Setup and configuration	Excellent
Remote control	Good
File transfer	Good
Management and security	Fair



Well integrated into Windows 95, LapLink seamlessly accesses the built-in Dial-Up Networking option.

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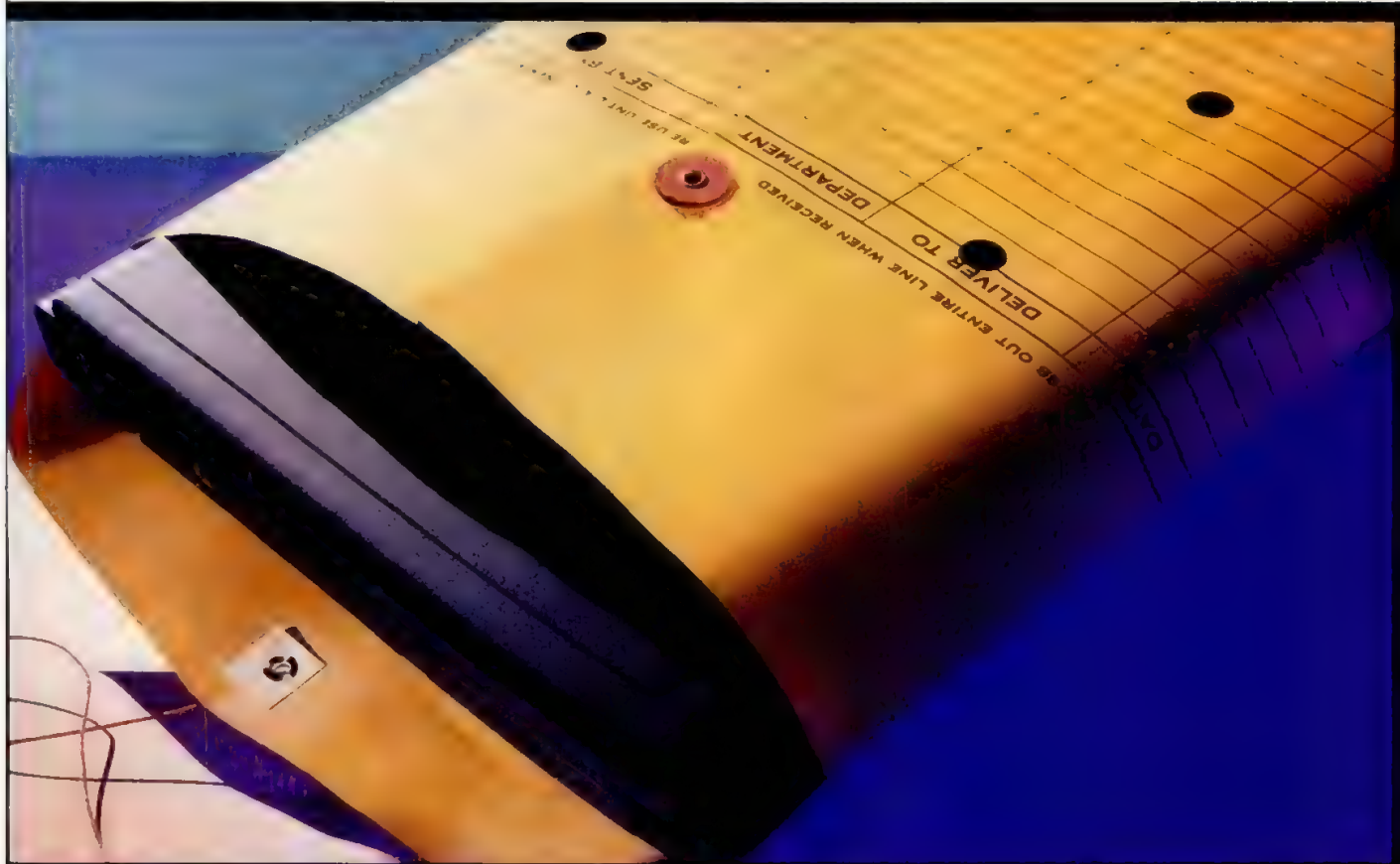
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PERFORMANCE TESTS

Remote-Control Software



ReachOut took the starring role on our performance tests overall, with Carbon Copy for Windows coming in second. Remotely

Possible/32 tested well on remote control, and Norton pcAnywhere32 sped through our File Transfer test.

What the Numbers Mean

The top performers on our File Transfer test over a direct dial-up connection were pcAnywhere32 and ReachOut. When transferring a highly compressible file, both achieved throughput greater than 345 Kbps—more than twice that of Remotely Possible/32 and more than three times that of NetOp for Windows—because of their superior compression schemes, proprietary dial-up protocols, and error correction. But when transferring a noncompressible file, ReachOut performed below average, showing that compression algorithms can slow down transfer of compressed data.

We found similar rankings when we ran the same File Transfer test over a remote-node connection, but throughput was lower overall than it had been over proprietary dial-up connections. We attribute the drop to the Point-to-Point Protocol (PPP) used for the remote-node connection, which adds overhead to the communications link. The exceptions were NetOp and Remotely Possible/32: Both had such ineffective compression that they actually benefited from the compression in the Windows 95 Dial-Up Networking client.

Our Delta File test measures a product's ability to transfer only the changes within files. ReachOut, Carbon Copy, and LapLink returned the best times (with a dial-up connection), but the difference between the fastest and slowest reviewed products was a mere 10 seconds.

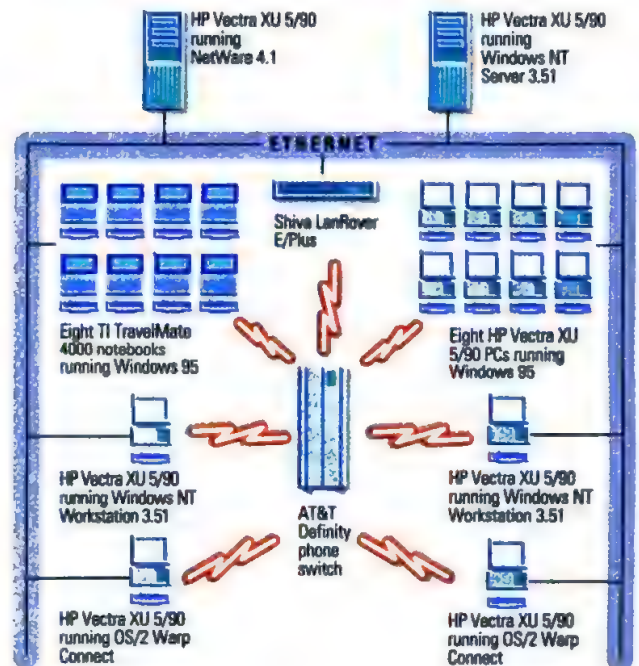
The Windows NT Workstation 3.51 versions of NetOp and pcAnywhere32 were slower over dial-up than their Windows 95 implementations. The difference is due to Windows 95's superior communications architecture. Similarly, Windows NT's built-in Remote Access Service (RAS) client uses less efficient compression than Dial-Up Networking.

Carbon Copy, ReachOut, and Remotely Possible/32 were the best performers on our Remote Control test over both dial-up and

remote-node connections. NetOp, unable to cache screens effectively, took twice as much time as its nearest competitor. Each vendor adds compression and caching to enhance performance. Most products intercept Windows' Graphics Device Interface (GDI), which manages elements that appear on the screen. The exceptions are NetOp and pcAnywhere32, which look in the graphics card's frame buffer or video memory and transfer screen bitmaps across the wire. Finally, we found that 32-bit products running on Windows 95 did not necessarily perform better than their 16-bit counterparts. This is possibly because of poor optimization of the 32-bit programs as well as Windows 95's own mixture of 16- and 32-bit code within its GDI and User components.—Analysis written by Jeffrey G. Witt

How We Tested

For the Windows 95 products, we first loaded the remote-client software on our TI TravelMate 4000 notebooks, then dialed our



found that we had trouble reading the smaller screen. The next release of LapLink will incorporate a screen-matching technique that will automatically reconfigure the host resolution to match that of the calling PC—a great feature that may make current scroll-bar and scaling techniques obsolete.

LapLink practically wrote the book on file transfers. The file-transfer utility is extremely easy to use: It looks and feels like the Windows 95 Explorer, with drag-and-drop capabilities. LapLink's SpeedSync

delta-file-transfer feature, similar to that of other products in this review, transfers only the changes within a file; the SmartXchange feature compares the contents of directories and transfers only files that have been modified. Another nice feature is the ability to rename long filenames before transferring to a Windows 3.x machine, which avoids truncated names (such as *filena~1.doc*). But LapLink does not offer remote-drive mapping or remote-printer redirection.

LapLink for Windows 95 supports a

wide array of connections, including modem, infrared wireless, serial or parallel cable (both included in the box), and network connections. But LapLink only supports the two major network protocols, IPX and TCP/IP, so if you need NetBIOS, NetBEUI, or VINES protocols, you'll have to look elsewhere. LapLink also supports the enhanced control port/enhanced parallel port (ECP/EPP) specification, which can boost the data-transfer rate up to 2 Mbps, compared with 300 Kbps for regular parallel ports.

HP Vectra XU 5/90C hosts using U.S. Robotics V.34 modems on both the clients and hosts. We set screen resolution to 640-by-480 with 16 colors and configured the software to call at top speed using an AT&T Definity switch. We performed all tests using each product's proprietary dial-up connection and then a remote-node connection dialing into a Shiva LanRover/E PLUS. We used the Windows 95 Dial-Up Networking client to establish our remote-node connection if the product supported it; otherwise we used the PPP client offered by the vendor.

We tested the Windows NT products with Windows NT Workstation 3.51 running on our HP Vectras, using Windows NT's Remote Access Service (RAS) for our remote-node test runs. Remotely Possible/32 for Windows NT does not include a dialer, so we tested it only over remote node. Finally, we tested cross-platform connectivity with each product's Windows for Workgroups product and any other operating systems supported.

For our **File Transfer** test, we transfer a highly compressible file

(7.7:1 ratio) and a noncompressible file (1:1 ratio) from the host to the client PC. We then divide each file-transfer timing by the file size to calculate throughput. For our **Delta File** test we use a 193K group of files on the host PC, which we then modify to 128K for the client. We time each product as it calculates the changes and updates the files from host to client.

The **Remote Control** test simulates a typical remote-control session using Microsoft Test's automated scripting tool. The test script calls Microsoft Word and Excel to open a series of documents from our NetWare 4.1 server and steps through a sequence of cutting, pasting, and other commands. It then opens Windows' Notepad and Calculator to create text and perform calculations. Finally it opens Microsoft Internet Explorer 2.0 to load and scroll through various Web pages from Microsoft Internet Information Server 1.0 running on a Windows NT 3.51 server. The test script then repeats in order to allow caching. We modified the script timing for each product to ensure that each task was completed.

	File Transfer		Delta File		Remote Control
	Highly compressible file	Noncompressible file	Delta File		
	Kbps	Kbps	Seconds		Minutes:seconds
Microsoft Windows 95					
Carbon Copy for Windows	284.4 258.0	26.3 27.0	19 25		5:00 4:26
InSync CoSession Remote	240.0 219.4	23.3 22.8	28 28		5:56 5:14
LapLink for Windows 95	191.7 167.0	30.7 27.7	21 27		6:25 6:40
NetOp for Windows	98.5 123.9	30.1 28.4	N/A N/A		13:57 13:55
Norton pcAnywhere32	347.5 349.1	30.6 29.6	25 25		5:36 5:36
ReachOut	357.5 349.1	21.9 28.4	18 22		5:30 4:52
Remotely Possible/32	129.6 207.6	20.1 27.0	24 23		4:55 5:20
Microsoft Windows 95 Dial-Up Networking*	91.4 72.5	25.6 24.4	36 40		11:03 11:40
Microsoft Windows NT Workstation 3.51					
NetOp for Windows	50.2 123.9	12.6 25.0	N/A N/A		15:36 14:43
Norton pcAnywhere32	256.0 179.8	30.1 28.4	27 27		6:28 7:03
Remotely Possible/32	N/A 156.7	N/A 25.3	N/A 20		N/A 4:56

* Reported for comparison.

N/A—Not applicable: The product does not have this feature

The 16-bit LapLink for Windows 3.x has a similar interface to its Windows 95 brother and the same remote-control, file transfer, and chat utilities. But the Windows 3.x version of LapLink does not support TCP/IP and does not include a remote-node client; both Carbon Copy and ReachOut offer remote-node PPP clients for Windows 3.x users.

To ease remote-control connectivity over the Internet, Traveling Software has established a Windows Internet Naming Service (WINS) server on the Internet for

registered users of LapLink. Normally you connect to another PC across the Internet by entering its static IP address. But if the PC at the other end has to dial into an Internet service provider, it is probably assigned a different IP address each time it logs on. By connecting to Traveling Software's WINS server, you can find another PC connected to the same server by entering its WINS name. LapLink does not support data encryption, though, so you must be aware that what you're transmitting could be intercepted.

Like Remotely Possible/32, LapLink offers a role-reversal feature. Useful for technical support, role reversal allows two computers that are connected to switch host and viewer duties without dropping the connection.

LapLink's security and access features offer the basic log-on name and password and service restrictions. By default, LapLink allows no access to your computer. You can also password-protect LapLink so that users can't modify its settings. An audit log tracks LapLink



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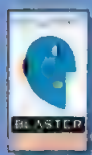
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CIRCLE 095 ON READER SERVICE CARD

SUMMARY OF FEATURES

Remote-Control Software

■ YES ■ NO

Products listed in alphabetical order

PC MAGAZINE
EDITOR'S CHOICECarbon Copy
for WindowsInSync Co-
Session RemoteLapLink for
Windows 95NetOp
for WindowsNorton
pcAnywhere32

ReachOut

Remotely
Possible/32

General Information

List price	\$89	\$79	\$149	\$295	\$149	\$149	\$169
Remote control/File transfer/Chat	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
32-bit architecture	■	■	■	■	■	■	■
Supports Plug and Play	■	■	■	■	■	■	■
Uses Windows 95/proprietary PPP client	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
TAPI/Unimodem support	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Uses proprietary phone book/Windows 95 shortcuts	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Remote installation	■	■	■	■	■	■	■

Connections

Serial/parallel/ECP port	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Analog modem/ISDN adapter	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
LAN/Internet	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Wireless IrDA	■	■	■	■	■	■	■
Integrates with Windows 95 dial-up networking	■	■	■	■	■	■	■

Remote Control

Multiprotocol wait-for-call	■	■	■	■	■	■	■
Simultaneous host and guest	■	■	■	■	■	■	■
Multiple host/viewer connections	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Color scaling/Redirected printing	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Session/permanent caching	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Can disable host PC wallpaper/screen saver	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Includes scripting	■	■	■	■	■	■	■
Provides a single interface for host and viewer	■	■	■	■	■	■	■
Remote drive mapping/drive redirection	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Role reversal/Remote reboot	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■

File Transfer

Transfers restored after interruption	■	■	■	■	■	■	■
Delta-file transfer/automatic file synchronization	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Synchronizes directories/drives	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Supports long filenames	■	■	■	■	■	■	■
File compression/encryption	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Terminal emulation/Virus protection	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■

Cross-Platform Support

Windows 95 viewer controls Windows 3.x/NT hosts	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Windows NT viewer controls Windows 3.x/95 hosts	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Windows 3.x viewer controls Windows 95/NT hosts	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Windows 3.x viewer controls OS/2, Mac hosts	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Windows 3.x viewer controls DOS host	■	■	■	■	■	■	■

Protocol Support

SLIP, PPP	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
TCP/IP	■	■	■	■	■	■	■
IPX, MP, RAS	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
NetBIOS, NetBEUI	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■

Security

Password encryption	■	■	■	■	■	■	■
Separate administrative password	■	■	■	■	■	■	■
User can set expiration date on password	■	■	■	■	■	■	■
Restrict access to drives/directories/files	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Disable screen/keyboard/mouse	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Audit log/Automatic dial-back	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
User can set time limits on sessions	■	■	■	■	■	■	■
Roving dial-back/Host lockout	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Intruder detection	■	■	■	■	■	■	■
Network log-on after attaching to host	■	■	■	■	■	■	■
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Remote Control over the LAN

By Steve Rigney

One drawback of a remote-node connection is that for good performance, any applications you want to use should reside on the remote client. Otherwise, launching a large application over a slow modem link could literally take half an hour. In that case, starting a remote-control session after connecting as a remote node becomes a necessity.

Although you can use any of the products in the main roundup over a remote-node connection, two remote-control products—Farallon's Timbuktu Pro for Networks and Funk Software's WanderLink—operate only over a remote-node or direct network connection. We didn't include them in our main review, because they don't provide a direct-dial connection to a host PC.

TIMBUKTU PRO FOR NETWORKS

The clear advantage of Timbuktu is its unique cross-platform support for Macintosh, Windows 3.x, and Windows 95. Unlike any other product, Timbuktu lets a Macintosh user remotely control a Windows PC and vice versa. The product works across IPX, TCP/IP, and AppleTalk Remote Access (ARA) local and dial-up network connections. Although Timbuktu currently does not include the ability to dial directly into another computer as all of the products in the main roundup do, Farallon plans to add this feature in a release later this year.

Timbuktu Pro for Windows, which is the same 16-bit software for both Windows 3.x and Windows 95, retails for \$199 for two users; the Macintosh version is \$199 for a single-user license. In addition to providing remote control, Timbuktu Pro lets you set it up to observe (but not control) a remote host, transfer files, and send flash memos with file attachments. The interface is extremely user-friendly; even a novice should have no problem installing and using it.

You have several choices when you want to establish a remote-control

session over a remote-node connection with Timbuktu. On a remote Windows 95 PC, Timbuktu uses Windows 95's Dial-Up Networking feature to connect using the Point-to-Point Protocol (PPP). For Windows 3.x users, Farallon includes Shiva Corp.'s PPP remote-node software.

You can connect to a Windows 95 PC running the PPP server software that's included with the Windows 95 Plus! pack (sold separately by Microsoft for \$55). Alternatively, you can connect to a Windows NT Server running Remote Access Service (RAS) or any dedicated PPP access server, such as those from Cisco, Shiva, or 3Com. The Macintosh version allows you to connect to an ARA server on your LAN over a dial-up connection.

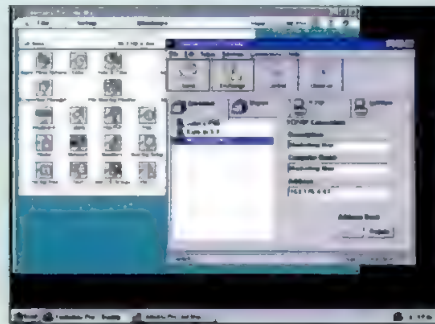
Like each of the products in the main review, Timbuktu lets you remotely control a computer across the Internet. Also, free to download from its Web site, Farallon offers Look@Me, a Netscape Navigator plug-in for both Mac and Windows; based on Timbuktu, it lets you observe other computers via a Web browser. As long as the host PC is connected to the Internet and you know its IP address, you can connect to the host via any type of Internet connection. But we recommend that you do not leave your host PC connected to the Internet unsupervised for remote control; Timbuktu's security is limited to a user name and password.

Timbuktu Pro for Networks. List price: Windows version with 2-user license, \$199; Macintosh version with single-user license, \$199. Farallon Computing Inc., 800-995-7761, 510-814-5100; <http://www.farallon.com>. Circle 496 on reader service card.

WANDERLINK

WanderLink is a remote-node server that runs as an NLM on your NetWare 3.x or 4.x server. The package includes WanderLink Proxy, a remote-control program that works across the remote-node connection. The product is easy to use, offers strong security features, and runs over both IPX and IP remote-node connections. The software ranges in price from \$295 for a single dial-in port to \$2,595 for 16 users.

WanderLink doesn't require a dedicated server PC or other hardware. As with Novell's NetWare Connect, you simply attach modems to your existing NetWare file server, load the NLMs, and enable your



Timbuktu lets you control a Mac from a Windows 3.x or Windows 95 PC—and vice versa.

connections. You can manage all of your dial-in users from a single Windows-based PC.

Funk provides WanderLink remote-node client software for DOS, Windows 3.x, and Windows 95. Once you are connected, you can access all of the LAN resources, except that the response will be much slower over a 28.8-Kbps modem link than on a 10-Mbps LAN.

WanderLink's security features include user names, passwords, data encryption, modem dial-back, and a feature called NodeID. NodeID allows you to set up a unique "fingerprint" of the remote PC. Even if an intruder tried to connect to the server with the proper user name and password, WanderLink would check the NodeID settings of the caller's PC and deny the caller access.

WanderLink. List price: 1 port, \$295. Funk Software Inc., 800-822-3865, 617-497-6339; <http://www.funk.com>. Circle 497 on reader service card.

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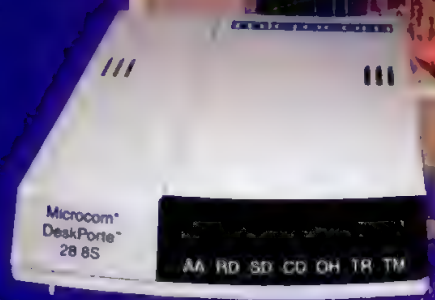
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activity, but it doesn't include information such as length of user sessions. LapLink refuses a connection after three failed log-on attempts, but it doesn't include intruder-detection lockout, data encryption, session time limits, or password aging—all features found in competing products such as ReachOut. Nor can you specify whether to allow read-only or read/write access.

The next version of LapLink will offer new features, including enhanced screen caching between sessions for faster remote-control performance and a wizard for automating file transfers.—*PB*

LapLink for Windows 95. List price: \$149. Traveling Software Inc., Bothell, WA; 800-343-8080, 206-483-8088; fax, 206-485-6786; <http://www.travsoft.com>. Circle 488 on reader service card.

Danware Data A/S

NetOp for Windows

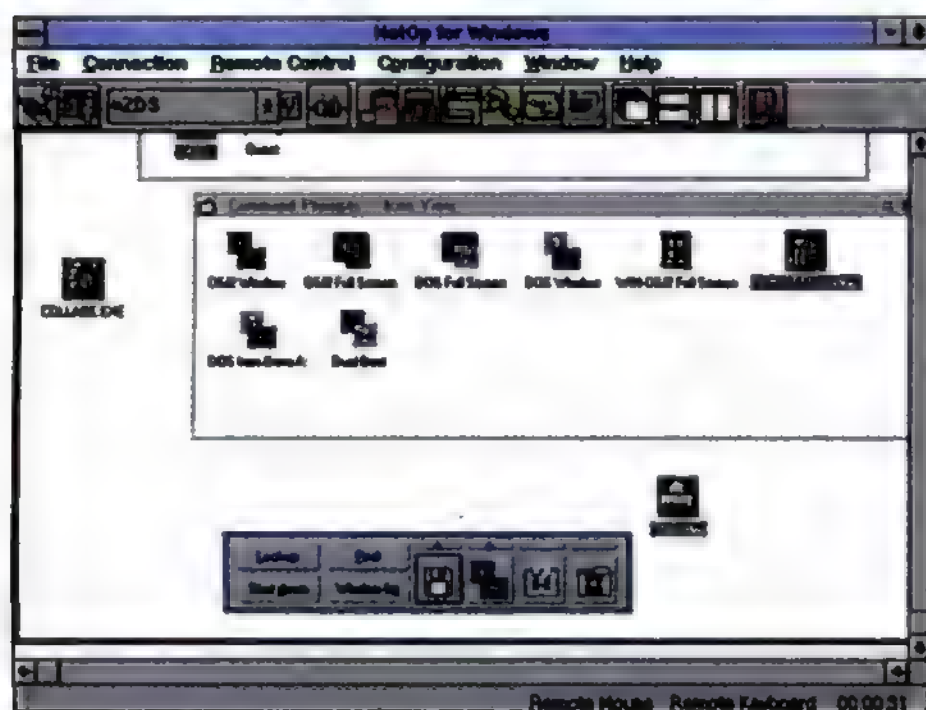
If you need remote control for multiple Windows and OS/2 platforms, and good performance is not important, NetOp for Windows might be your solution. NetOp (\$295) works across more platforms than any other product in this roundup, letting you simultaneously control PCs running DOS, OS/2, Windows 3.x, Windows 95, and Windows NT across a network or a dial-up connection. Unfortunately, though it is the most expensive package in our roundup, NetOp doesn't offer many of the powerful features found in other products, such as file synchronization and long-filename support, and

its performance was near the bottom on most of our tests.

NetOp for Windows includes both a host and client license. NetOp uses a combination of 16-bit and 32-bit code to run on Windows 3.x, Windows 95, or Windows NT Workstation. Danware also offers 16-bit versions of NetOp for OS/2 (\$295) and DOS (\$120). All versions are compatible across platforms and offer similar interfaces and feature sets. NetOp is produced by Denmark-based Danware Data A/S and distributed in the U.S. by Markham Computer.

NetOp works with both dial-up modem and ISDN connections and across networks running TCP/IP, NetBIOS, and IPX. The software is a snap to install, and all you have to know is the name of the host PC you want to control, any required passwords, and the connection type you want to use. The installation doesn't change any drivers in your Windows .INI files, but it does make some changes to your OS/2 CONFIG.SYS file. The program also offers an uninstall utility for the Windows version, but not for the OS/2 version.

Our favorite feature of the NetOp family is the ability to control multiple computers from a single PC. Both LapLink for Windows 95 and Remotely Possible/32 have similar features, but NetOp offers a wider range of platforms. To test this, we installed various versions of NetOp on OS/2, Windows for Workgroups, Windows 95, and Windows NT Workstation. We were able to simultaneously control all of the Windows-based



Unique among the products we tested, NetOp for Windows can remotely control a PC running OS/2.

PCs from our PC running OS/2, and vice versa. We successfully connected to multiple computers over the network running IPX, NetBIOS, and TCP/IP. We also established single cross-platform connections using a dial-up modem.

While the product is easy to use and navigate, its performance was significantly below every other product we reviewed. Not only were the file transfers slow, but during remote-control operation it took a long time to refresh the screens on the

remote PC, even across a 10-Mbps Ethernet connection. If you're going to transfer small files between different platforms, this performance is fine. But if you're going to navigate complex server-based applications or transfer large files, you'll find better solutions in pcAnywhere32 or ReachOut. If you need to remotely control an OS/2 machine, you'll want to consider Hilgraeve's KopyKat or International Software Solutions' Remote Services Management (see "Remote Control for OS/2" in this feature for more information).

NetOp offers a unique feature for technical support help desks called Request Help. The host user can use Request Help to report problems to a help desk with a click of the mouse. Any NetOp clients that are registered as help guests will immediately see the message and have the option of taking control of the user's PC. The product also offers a basic chat utility if the administrator needs to communicate with users. Unfortunately, the product doesn't offer role reversal.

The security features are fairly powerful and include passwords as well as roving and fixed call-back numbers. If you are using ISDN, NetOp can even check the incoming number for added security.

NetOp offers a basic file-transfer utility that can send files both to and from the host PC, but you can't synchronize directories or map drives. Other features that are missing from NetOp are detailed management utilities and log files, so there's no way to detect a failed connection, or to tell who connected and for how long. NetOp also does not support long filenames.

NetOp is best for network administrators who need an easy-to-use, multiplatform solution for controlling PCs on the LAN. But the product's below-average performance and its lack of key features detract from its viability as a dial-up solution.—*Steve Rigney*

NetOp for Windows 5.2. List price, \$295. Markham Computers Corp., Boca Raton, FL; 800-262-7542; fax, 407-394-3844; <http://www.danware.com>. Circle 489 on reader service card.

SUITABILITY TO TASK

NetOp for Windows

Setup and configuration	Good
Remote control	Poor
File transfer	Poor
Management and security	Fair

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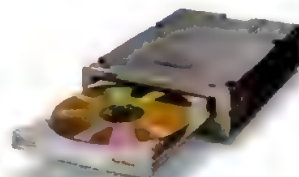
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PHILIPS

Symantec Corp.

Norton pcAnywhere32

Veterans of remote control, Symantec's pcAnywhere products run the gamut of Microsoft operating systems. To its DOS and Windows 3.x versions, Symantec now adds Norton pcAnywhere32 for Windows 95 and Windows NT. In pcAnywhere32 (\$149 for the two-user version) Symantec combines the features of previous releases—including remote control, file transfer, chat, and security—with a completely redesigned 32-bit version. Its multiplatform compatibility, Windows 95 integration, and good security and management features make pcAnywhere32 suitable for larger installations. But the product suffers from laggard remote-control performance, so individual users may want to consider ReachOut or Remotely Possible/32 instead.

Symantec says that pcAnywhere32 is faster than previous releases, and except on the Delta File test, pcAnywhere32's file-transfer performance was excellent. But we weren't impressed with its remote-control speed: It scored in the bottom half on our remote-control test, and its remote-control performance was noticeably slow in actual use.

Regardless of the platform, all the Symantec remote-control products work seamlessly with one another over modem, ISDN, network, or cable connections. (A parallel-port cable is included.) The pcAnywhere family also supports more protocols—IPX or SPX, TCP/IP, NetBIOS, NASI, and VINES—than any other product we reviewed. But pcAnywhere32 does not support multiple simultaneous connections, as do LapLink and Remotely Possible/32.

The 16-bit pcAnywhere 5.0 for DOS (\$129) and pcAnywhere 2.0 for Windows (\$129) are well established and very mature. The latter, which works with Windows 95, has the same features as the DOS version, with an easy-to-use, cohesive interface. Both are easy to install and configure. The new pcAnywhere32, for either Windows 95 or Windows NT Workstation, is compatible with the other products, but we found that remote-control performance lags when connecting an NT machine and a Windows 3.x or 95 PC.

Installing pcAnywhere32 is a breeze,

with its extensive wizards and TAPI support. The Quick Start button launches wizards that help you set up and configure pcAnywhere32 quickly and easily. You can customize the interface, which is so completely integrated into Windows 95 that pcAnywhere32's Dial-Up Networking interface looks and behaves exactly the same as Windows 95's. With pcAnywhere32, you can drag connection icons—which are actually OLE 2.0 objects—onto the Windows 95 desktop for even easier access, and all items support right-click menus.

You can view a remote host either in full screen or in a window. If the host screen has a higher resolution than the remote, pcAnywhere32 lets you either scroll or scale the screen to fit. Other options, such as disabling host wallpaper, are useful for increasing pcAnywhere32's performance. The Color

Scale feature allows the host to be set up so you can limit the number of colors viewed (for example, to four colors) to enhance performance.

The file-transfer interface doesn't follow the rest of the product's Windows 95 integration. It doesn't display directories in a hierarchical structure, for example, but

SUITABILITY TO TASK

Norton pcAnywhere32

Setup and configuration	Good
Remote control	Fair
File transfer	Good
Management and security	Excellent



Norton pcAnywhere32 carries the features of previous versions into a redesigned 32-bit application.



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Remote-Control Software

it does provide antivirus protection with Norton Anti-Virus, even over the Internet, a feature also offered by ReachOut. SpeedSend, pcAnywhere32's delta-file-transfer feature, copies only the portions of a file that have been changed. In addition to synchronization and replication of directories, pcAnywhere32 offers an extensive scripting utility. And like ReachOut, pcAnywhere32 includes a terminal-emulation feature for calling bulletin-board systems and online services.

A unique gateway feature lets an administrator install pcAnywhere32 on a network server. The gateway can let network users dial out to an online service, a BBS, or a pcAnywhere host, and it can also let users dial in via pcAnywhere to get network access. This is useful for giving network users remote-access capabilities and letting the network administrator centrally manage how the product is used.

Security is comprehensive. In addition to standard name and password security, pcAnywhere32 offers data encryption, time limits, and host notification. As with almost every other product, you can password-protect the host machine so that local users can't modify settings. Although pcAnywhere32 does not have intruder detection like ReachOut, its host log captures failed password attempts. In addition, pcAnywhere32 lets you specify which drives—but not which directories or files—each user can access and whether to allow full or read-only access.—PB

Norton pcAnywhere32. List price: 2-user version, \$149. Symantec Corp., Cupertino, CA; 800-441-7234, 408-253-9600; fax, 408-253-3968; <http://www.symantec.com>. Circle 490 on reader service card.

Stac Inc.

ReachOut



With support for DOS, Windows 3.x, and Windows 95 in a single box, ReachOut, Version 5.05 (\$149), boasts excellent security features, high-performance file transfers, virus checking, scripting, and TAPI support. These features and its top-notch remote-control and file-transfer scores on our performance tests earned ReachOut our Editors' Choice for the

second year in a row. Our only complaint is that ReachOut's Windows 95 integration is limited, but ReachOut 6.0, which should be available by the time you read this, promises to address this problem.

ReachOut can handle just about any remote-networking configuration, including analog-modem, ISDN, network, cellular-modem, and remote-node connections. ReachOut also works with a variety of network protocols, including IPX/SPX, NetBIOS, TCP/IP, and VINES. Stac offers a coupon for a free copy of Shiva's PPP client for Windows 3.x users, though as with Microcom's dialer, you must pay for shipping and handling.

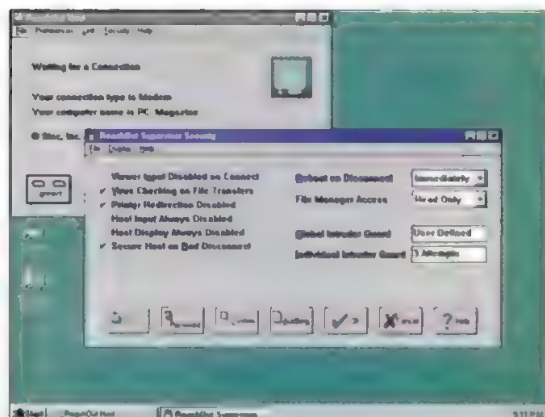
When you install ReachOut in Windows 3.x or 95, you can choose whether or not to install the DOS components. The ReachOut interface, identical in Windows 3.x and in Windows 95, was relatively easy to configure and use. As in many of the products we reviewed,

host and viewer applications are separate programs. The configuration, supervisor, and password functions are also set up as separate applications, which is somewhat confusing at first. Unlike LapLink and Remotely Possible/32, ReachOut can support just one connection at a time and has

SUITABILITY TO TASK

ReachOut

Setup and configuration	Good
Remote control	Good
File transfer	Excellent
Management and security	Excellent



ReachOut's security is second to none: It can even shut down the host PC if it detects an unauthorized user.



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Remote-Control Software

no role-reversal feature. ReachOut does supply a scripting feature, however, which lets you set up an icon on your desktop to automate tasks, and includes a terminal-emulation feature to dial bulletin-board systems.

ReachOut, which uses Stac's LZS compression algorithm, was one of the best overall performers on our tests. It had the best throughput on our Delta File test and on our File Transfer test with a highly compressible file. With a noncompressible file, however, ReachOut's compression actually slowed down the transfer, making it slower than the fastest products over a direct dial-up connection. ReachOut also provided some of the best remote-control performance of the group, with hardly any delays in response.

The product's file-transfer utility includes RapidSync, which synchronizes directories, and SmartSend, Stac's delta-file-transfer feature, which transfers only the changed portions of files. Despite its Windows 3.x-like interface, ReachOut supports long filenames. Like pcAnywhere32, ReachOut can be set to scan for viruses during file transfers, although doing so degrades performance.

ReachOut's security is second to none, with password encryption, modem callback, and aging-password options. You can set up the host by user to allow full or read-only access, although you can't specify rights for directories or files. The Intruder Guard option lets you disable access to the host computer altogether after a specified number of failed log-on attempts. As in CoSession, a host confirmation feature lets an operator at the host PC accept or reject connections. ReachOut also allows you to password-protect the configuration options with the user name "master."

A new version of ReachOut, Version 6.0, is scheduled to be available by the time you read this. It will combine the viewer and host components (as does LapLink), improve file-transfer performance, and integrate better with the Windows 95 interface. One of the most intriguing new features is a personal FTP server that will allow you to access files on your desktop from any Web browser, if the firewall on your corporate LAN is configured properly. This new version, as well as a native Windows NT version planned for later

this year, will round out Stac's feature-rich remote-control package.—PB

ReachOut 5.05. List price: \$149. Stac Inc., San Diego, CA; 800-522-7822, 619-794-4300; fax, 619-794-4575; <http://www.stac.com>. Circle 491 on reader service card.

Avalan Technology Inc.

Remotely Possible/32

Avalan Technology offers a family of remote-control products for Windows 3.x, Windows 95, and Windows NT. Remotely Possible/32 had good performance on our Remote Control test, and it includes useful features such as data encryption, role reversal, and multiuser connections. But its Windows NT version does not include a dialer, and Remotely Possible lacks some advanced security features as well as scripting and virus checking that would make it a more complete solution.

Remotely Possible/32 for Windows 95 consistently performed well on our Remote Control test but showed poor file-transfer performance. Remotely Possi-

ble/32 for NT also was slightly better than pcAnywhere32 on our Remote Control test over RAS. As with pcAnywhere32, remote-control performance between the Windows NT version and Windows 95 version was very slow. Also, the Windows 3.x viewer cannot control a Windows NT host.

The Remotely Possible family consists of five separate products, but with no support for DOS. Unlike other products in this review, there are different versions of Remotely Possible for Windows 3.x for different communication methods, and each version is sold separately.

Three of the products, each priced at \$169 (list), are 16-bit Windows 3.x applications with the same interface. Remotely Possible/LAN offers Windows 3.x clients remote control and file transfer over IPX, NetBIOS, or NetBEUI. The product also supports NASI, Interrupt 14, and asynchronous communications server (ACS) modem pooling. Remotely Possible/Dial is a modem-only Windows 3.x version, and Remotely Possible/Sockets is a Windows 3.x Winsock-compatible version that does not include



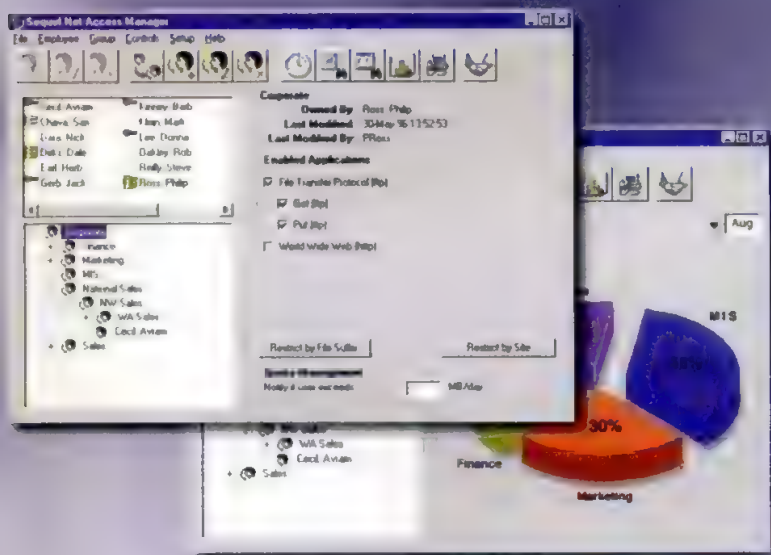
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Although the core of Sequel Net Access Manager is a powerful IP packet filter, the main user interface is intuitive enough for non-IS managers to establish access privileges and run reports.

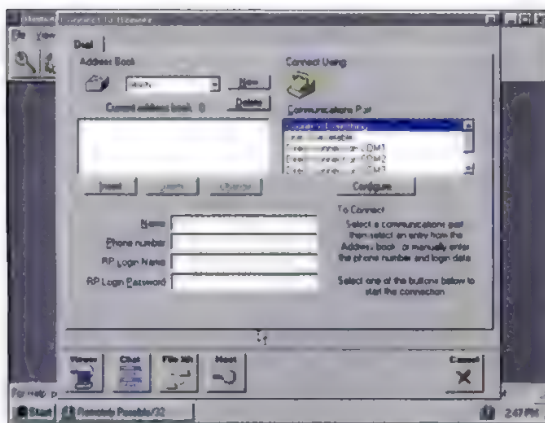
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Sequel NET ACCESS MANAGER
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While Remotely Possible/32 for Windows 95 includes a dialer, the Windows NT Workstation version lacks one.

a TCP/IP stack.

Remotely Possible/32 for 95 (\$169) and Remotely Possible/32 for NT (\$199 for NT Workstation; \$399 for NT Server) use a similar 32-bit code, but each product must be purchased separately at different prices. (A version of Remotely Possible/32 is available at Avalan's Web site for a free 30-day evaluation.) Remotely Possible/32 supports connections over modem and TCP/IP; IPX support was not available in the version we tested, but according to Avalan it should be included by the time you read this. Remotely Possible/32 for NT does not have a dialer, so it could not complete our dial-up tests. We had to use Windows NT's built-in RAS client to complete our remote-node connection testing.

Remotely Possible/32 offers very good performance on both Windows 95 and NT and the same simple, easy-to-use interface. Integration with the Windows 95 interface is good, and Avalan plans to support Windows NT 4.0 when it is released.

You can configure the viewer to disable host wallpaper and set printing options. The viewer screen lets you choose to navigate remote hosts that have higher resolution screens using an auto-pan mode, which scrolls the screen by following the viewer's mouse movement, but Remotely Possible does not have a scaling feature that will shrink the host screen to fit the viewer's screen.

Like the other packages in this review, Remotely Possible/32 supports drag-and-drop file transfers. But the files are not immediately copied from

the source to the destination: You must first place the files in a queue and then initiate the file transfer. While this extra step may be a little inconvenient, it does allow you to choose files from multiple directories and copy them all at once instead of one by one. But unlike ReachOut or pc-Anywhere32, Remotely Possible lacks any antivirus protection for file transfers.

Useful for technical support and training environments, Remotely Possible/32 supports multiple user connections and role-reversal capabilities, features also available in LapLink. You can view several hosts or clients at one time in cascaded or tiled screens.

Security in Remotely Possible/32 is not as complete as in ReachOut. It includes basics like user name, password, and data encryption as well as the ability to disable specific functions of Remotely Possible, such as file transfer. Remotely

Possible/32 also supplies an event log for tracking file transfers, host and viewer transactions, and even protocol use on hosts and viewers. A host confirmation option lets the host PC operator deny access. But unlike ReachOut, Remotely Possible/32 does not have an intruder-detection facility to disable the host computer in the event of unauthorized access attempts. Moreover, you can't set password aging, session time limits, or a maximum number of login retries. Remotely Possible/32 lacks scripting capabilities to automate procedures, but Avalan says they will be added by the time you read this.—PB □

Remotely Possible/32. List price: Windows 95 version, \$169; Windows NT Workstation version, \$199. Avalan Technology Inc., Holliston, MA; 800-441-2281, 508-429-6482; fax, 508-429-3179; <http://www.avalan.com>. Circle 492 on reader service card.

SUITABILITY TO TASK

Remotely Possible/32

Setup and configuration	Good
Remote control	Good
File transfer	Fair
Management and security	Fair



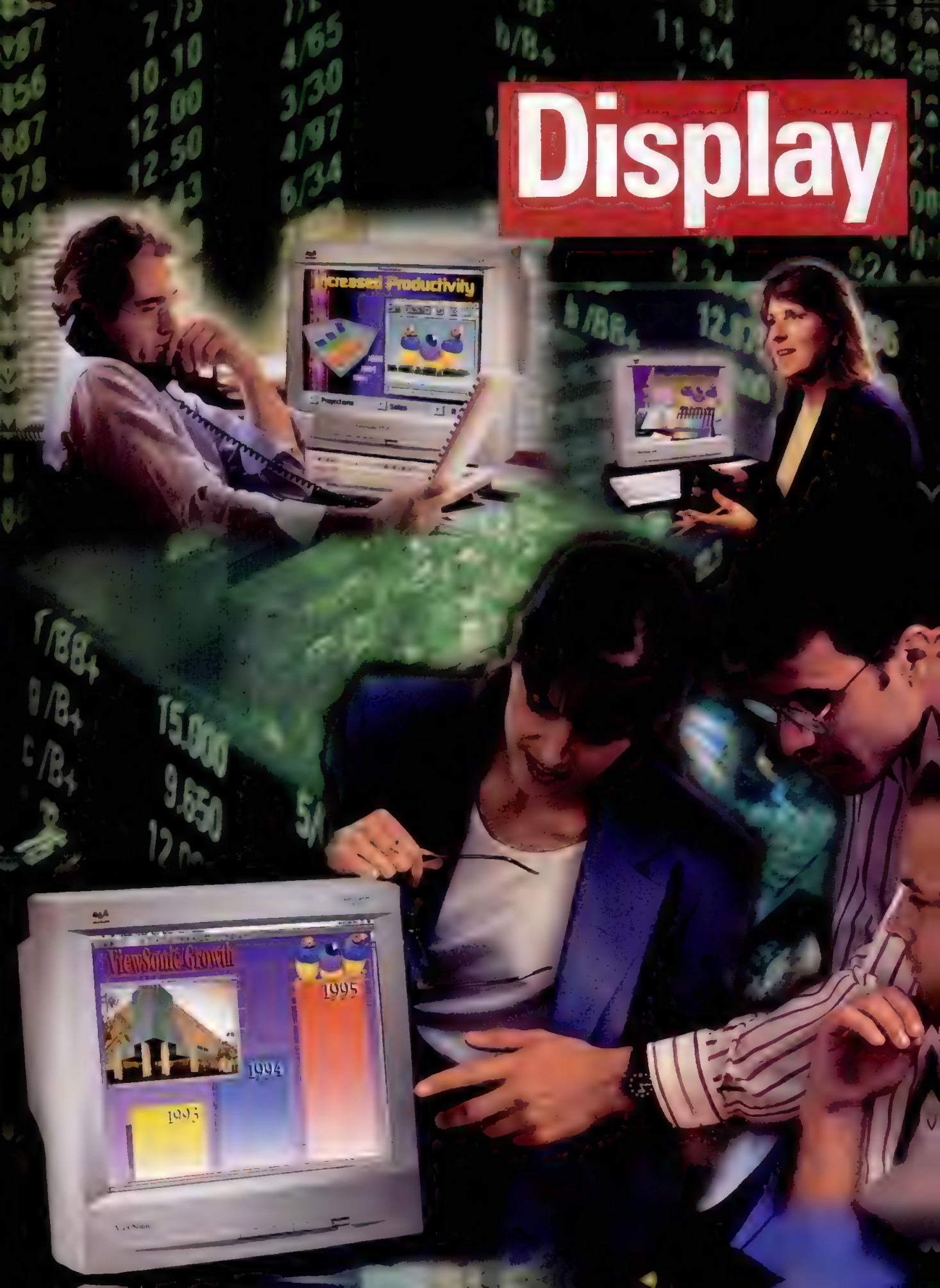
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ViewSonic 17GS	17"/16.0"	0.27mm	1,280 x 1,024	Yes	Yes	\$749
ViewSonic 17GA	17"/16.0"	0.27mm	1,280 x 1,024	Yes	Yes	\$799
ViewSonic GT770	17"/15.9"	0.25mm*	1,280 x 1,024	Yes		\$899
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Windows 95 Scripting Tools: Control Through Code

Seven scripting languages for automating and integrating Windows 95 applications.

By Barry Simon

As we go through the same clicks day after day, or manually move the same types of information from one application to another, we might well wonder: Did computers save us from one kind of drudgery just to replace it with another? Automation and application-integration tools like the seven Windows 95 products in this roundup offer a solution for putting these repetitive tasks on autopilot. Of the seven programs under review, four—Nombas's CEnv, Quercus Systems' Personal REXX, Desiderata Software's PowerScript, and Wilson WindowWare's WinBatch—are conventional batch languages that produce

ASCII scripts. They are normally run by giving a script a language-specific extension and launching it with double clicks or through Windows 95 shortcuts. Two of the products—Softblox's SmartPad and SmartDesk's Virtual Desk—are more macro delivery schemes than scripting languages. Some users will just exploit these two products' ability to send keystrokes or menu commands to applications and never write a line of code, although

IN THIS SECTION



TUTOR Everyone is talking about Java, but do you know what it is, what it looks like, and how it will change the way we use the World Wide Web? A high-level overview of the language and some of the ways in which it is already being put to use gives you answers to the questions you've been meaning to ask. *Page 279.*



POWER PROGRAMMING Last issue, we discussed the basics of using DirectDraw, Windows 95's new game programming interface in a C++ environment. Now we explore how this functionality can be merged into a Win32 application using MFC. A simple game provides a practical look at this new API. *Page 287.*



INTERNET TOOLS Java promises to run the same multimedia application on a multitude of operating systems. But can Java live up to that promise? JavaTime, a Java clock applet, helps us explore this question as it relates to audio capabilities. *Page 297.*

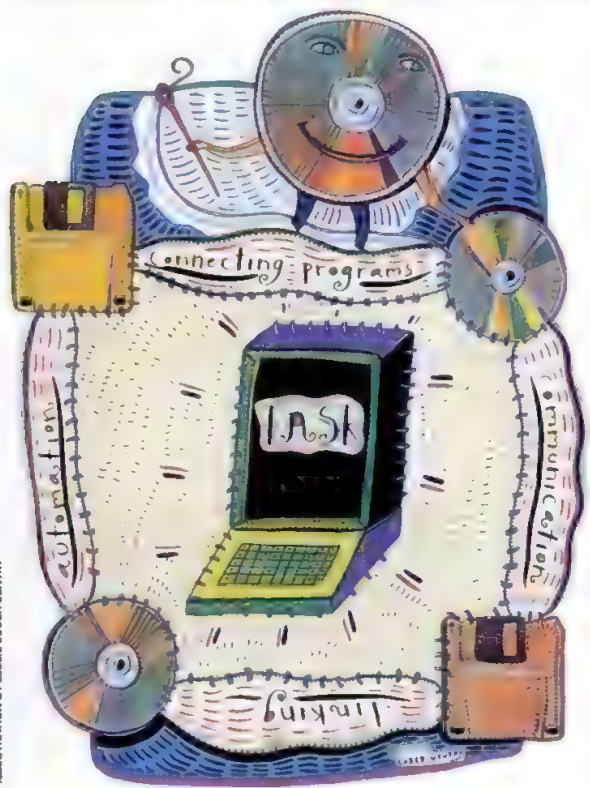


UTILITIES Microsoft decided not to include a recently used programs list in the final release of Windows 95, but Jeff Proise makes the option available with this issue's utility, RUPL. It remembers the programs you use most frequently, giving you a handy way to launch them. *Page 313.*



LAB NOTES Notebook vendors now have a single standard for accurately rating the battery life of their systems. BatteryMark, a new Ziff-Davis benchmark test program, and its accompanying hardware, ZDigit II, create a testing protocol that is accurate, inexpensive, robust, and easy to use. *Page 333.*

ALSO IN THIS ISSUE In PC Solutions, we present a remarkable batch file that highlights some features of the FOR command, a tip for better managing-program execution in a Windows 95 batch file, an overview of WordPerfect's find-and-replace options, a way to get nested subtotals in Excel, and more. *Page 381.*



both have full scripting syntax. The last product, Oberon's Prospero, is a visual scripting tool in which program flow is defined by dragging lines between objects on-screen rather than by writing code.

Of course, automation should ideally be provided by the operating system, but if anything, this function seems to be on the decline. DOS has had a batch language since Version 2.0, but Windows has never included a built-in language. Windows 3.x had a keyboard macro recorder, but it was dropped in the transition to Windows 95. (An exception to this trend is the new functionality in Windows 95's DOS batch language—most notably, its ability to start Windows applications.) OLE 2.0 protocols allow impressive communication between applications designed to use them, but OLE also demands scripting capability to automate its power.

OUR EVALUATION

In evaluating automation tools, we found that any one of a number of features could be critical for its overall usefulness. Initially, we looked at the flexibility of the underlying scripting language in terms of variables and control structures. Here, we encountered a wide variation, from elegant C-like languages to quick-and-dirty coding syntax. A clever coder can generally find workarounds for almost anything, but you want to be able to use the standard constructs of a structured language. In particular, we found that true arrays are not widely supported.

We also looked at how each product lets you control Windows applications, integrate them, and pass data between them. Sending keystrokes and low-level mouse actions can be useful, but calling menus directly is more robust. OLE automation, supported by four of the seven products, makes it possible to pass rich data objects between applications with relative ease.

All of the tools provide coding systems, but only two let us generate code based on recorded actions—useful for quick-and-dirty work and for roughing out skeleton scripts. Surprisingly, many of the products also lack a dialog-box editor, making it more difficult to build interface elements for capturing user input. Some of the languages provide encapsulations of the Windows common dialogs. We found that debugging facilities range from nonexistent to fully adequate modules that provide breakpoints, trace, and watch variables.

Nombas

CEnvi

ALL REVIEWS BY BARRY SIMON

Nombas's shareware scripting program for 32-bit Windows, CEnvi 2.11 (\$69), is an interpreter for the company's proprietary language, Cmm (C minus minus), a simplified dialect of C. In Cmm, variables are not explicitly typed or predeclared, and

• SmartPad Pro, SmartPad Desktop • WinBatch, WinBatch+Compiler

Of the seven automation tools we reviewed, two really stand out: Softblox's SmartPad and Wilson WindowWare's WinBatch. SmartPad, Version 3.5, gives both

novices and experts the ability to make useful button pads that launch automation scripts. Experts will want SmartPad Pro in order to use the powerful scripting language, integrated development environment (IDE), and debugging facilities.

End users can use SmartPad Desktop to run scripts created in the Pro version or to create button pads to automate basic tasks.

As a straight batch language, WinBatch comes out on top. Its syntax is especially well adapted for providing rich Windows functionality. It also gives you a dialog-box



editor, a macro recorder, and many script-launching mechanisms. The WinBatch+Compiler lets you compile and distribute your applications royalty-free.

Oberon's Prospero earns an honorable mention for bringing a powerful visual metaphor to automation programming. Working with Prospero's application-specific building blocks can be far easier than writing comparable OLE automation code, but it is likely to be less attractive to those with extensive programming experience.

there are no pointers. There are also no explicitly defined structures, although you can set up on-the-fly structures much as you can in REXX.

The result is an interpreted batch language with much of the power of C but some of the quick-and-dirty flavor of old-fashioned BASIC. It will obviously appeal to experienced C programmers; those without C experience may find it forbidding.

CEnvi supports most of the functions in the standard C library and adds to those with other useful built-in functions. It also provides libraries of additional functions with text-file function definitions that can be added with an #include directive. These libraries encapsulate a fair number of Windows API calls, giving the Cmm programmer quick access to services such as menu invocation in any running application. The libraries are useful, but they don't offer much in the way of error checking. Documentation is limited to comments in the individual .LIB files.

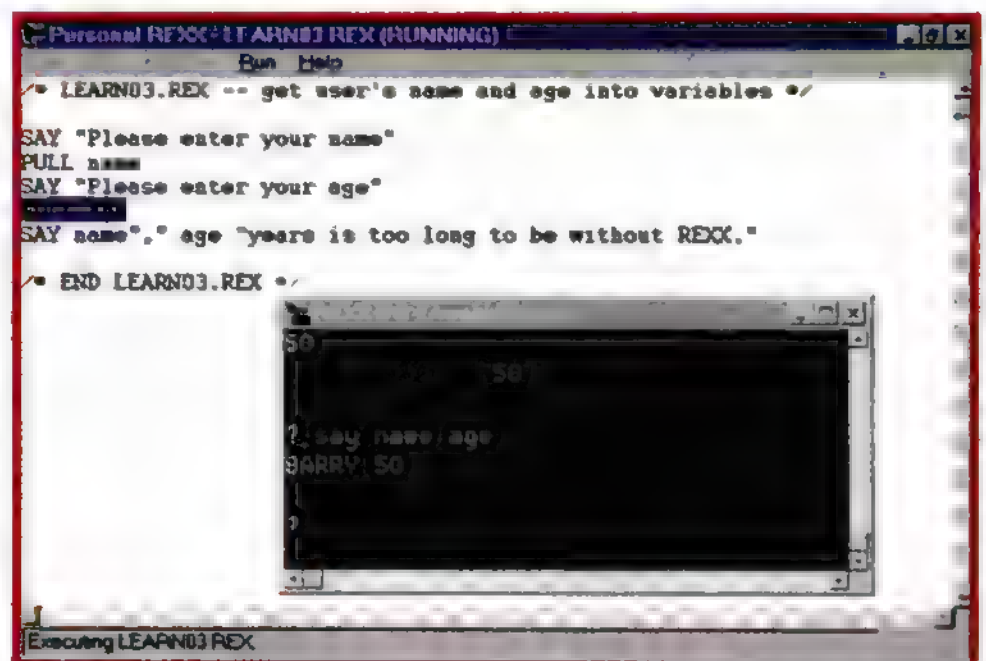
CEnvi is missing a number of features, including recording capability and a dialog-box editor. The current version lacks a debugger, although one will be included in Version 3.0, which is expected to be out by the time you read this. The only direct ways to run scripts are by double-clicking or using the Run command, although you can activate them through Windows 95 shortcut hotkeys. CEnvi versions exist for DOS, OS/2, Windows 3.1, and a variety of Unix flavors, and

Nombas is developing Cmm as a scripting language for the Web. CEnvi scripts can be compiled to standalone .EXE files; you need a license from Nombas to distribute them. CEnvi is not devoid of rough edges; nevertheless, any C programmer looking for a Windows scripting tool will want to take a closer look. **CEnvi 2.11.** Shareware registration fee: \$69. Nombas, Medford, MA; 617-391-6595; fax, 617-391-3842; <http://www.nombas.com>. Circle 441 on reader service card.

Quercus Systems

Personal REXX for Windows

OS/2 users converting to Windows may well miss REXX, OS/2's native scripting language. Quercus Systems' Personal REXX for Windows, Version 3.5 (\$175), available for Windows NT and Windows 3.1, can



Personal REXX's trace mode lacks a true watch window, but the interactive window lets you test the value of any variable.

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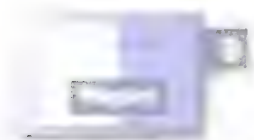


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you're out of touch
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nature.

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Compatible with you.

fill that void. Quercus recommends running the 16-bit version under Windows 95 because of problems the company says stem from Windows 95 itself.

Personal REXX will also be an attractive possibility for those looking for a scripting language suited to pattern matching and manipulation of text, areas in which REXX shines. The language, with untyped variables and pointed variables (a highly flexible replacement for the arrays and records used by other languages), is a pleasure to use. A pointed variable such as `foo.1.2`, for example, could replace an array like `foo[1,2]`. But because REXX also lets you use `foo.name` and `foo.address`, you are able to deal with more general objects than is possible with standard arrays. Personal REXX performs variable substitution on anything after the period, so that `foo.1.j` will be interpreted as `foo.1.2` if `i=1` and `j=2`.

Debugging is straightforward, as Personal REXX supports the trace mechanism used by standard REXX. There is no watch window, but you can examine the value of any variable at the prompt displayed between program steps.

Personal REXX gives you access to a number of Windows-specific functions that let you send keystrokes or Windows messages to any program. But it offers less control over Windows and Windows applications than any other products in this roundup. You can set up simple dialogs that return a single yes/no choice or display a simple text-input box, but there is no mechanism for building complex input dialogs.

Both a runtime version and an interface for C programmers to call the REXX DLL are available. The company offers similar implementations of Personal REXX for DOS and, of course, OS/2.

Personal REXX for Windows 3.5. List price: \$175. Quercus Systems, Saratoga, CA; 800-440-5944, 408-867-7399; fax, 408-867-7489; <http://www.quercus-sys.com>. Circle 442 on reader service card.

WINDOWS AUTOMATION LANGUAGES AT A GLANCE							
	CEnvi 2.11	Personal REXX 3.5	Power- Script 1.0	Prospero 1.0	SmartPad 3.5	Virtual Desk 2.0	WinBatch 96B
Language							
Arrays				✓	✓	✓	
Pointed or list variables	✓	✓	✓				✓
DDE	✓			✓	✓		✓
OLE automation	✓			✓	✓		✓
Development Tools							
Script editor or IDE		✓	✓	✓	✓	✓	
Record keystrokes or mouse clicks					✓		✓
Record menu choices					✓		
Dialog-box editor				✓	✓		✓
Debugging							
Trace		✓		✓	✓	✓	✓
Breakpoints				✓	✓	✓	✓
Watch window					✓	✓	✓
Script Launch Methods							
Via extension	✓	✓	✓	✓			✓
Button pad or clickable object					✓	✓	
Pop-up menu					✓	✓	✓
Drag-and-drop target			✓			✓	

Desiderata Software

PowerScript

Desiderata Software's PowerScript 1.0 (\$80) is a shareware scripting tool for Windows 95 and Windows 3.1 that uses a proprietary language with a C-like syntax. As you might expect from a 1.0 release, PowerScript lacks several amenities, but it is intelligently designed and offers some powerful constructs that at a minimum bear close watching.

The language uses predeclared typed variables and offers most basic data types and control structures. It lacks a Case statement and arrays, but its string-manipulation and pattern-matching functions are strong enough that one could easily mimic the tab-delimited, arraylike objects found in WinBatch.

An intriguing feature of the language is what PowerScript calls *iterators*. These are functions which, used in a For loop, let the

loop successively run through all instances that the iterator finds. For example, you could use the Files iterator in a loop beginning `For t in Files (C:\*.*.dll)` where `t` is a string variable that is successively defined to each DLL on disk. Other iterators are provided for lines in a text file and for lines in Clipboard text.

PowerScript won't let you create or display elaborate dialog boxes, but it does give you func-

tions to get simple string input or input from a dialog containing a single group of radio buttons. There is no explicit debugging or single-stepping, but the package includes an editor that highlights the current line of a script as it runs.

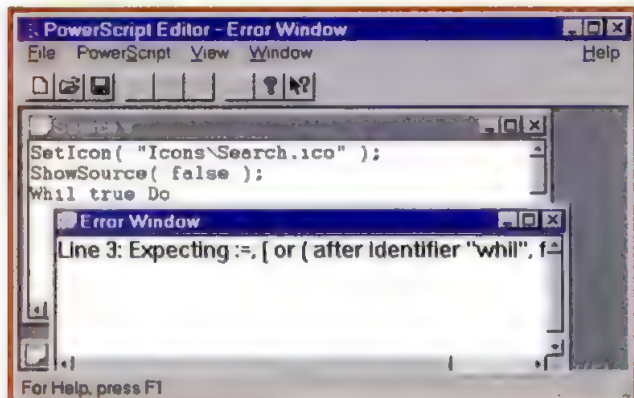
One of the program's strengths is its ability to communicate directly with other programs. You can locate windows and dialogs and send them keystrokes, menu choices, or even Windows messages (there is no DDE or OLE automation support, however). Another powerful feature is the ability to iconize a script on the desktop, which can then become a drag-and-drop target capable of initiating scripting actions when a file or group of files is dragged onto it.

PowerScript 1.0. Shareware registration fee: \$79.90. Desiderata Software, Chestnut Hill, MA; 800-494-8334, 617-292-5250; <http://www1.usa1.com/~desisoft>. Circle 443 on reader service card.

Oberon Software Inc.

Prospero

Oberon Software's Prospero, Version 1.0 (\$695), takes a novel visual approach to application integration and automation. Working in a project-oriented development environment, you use a visual programming metaphor to build scripts from application objects by drawing links between them that define and expose your program logic. You begin your application by dragging program-specific building blocks from a palette to the Program Canvas. Blocks have visual inputs and outputs. For example, a Word Doc block has file bookmarks as inputs or outputs, and an Excel Doc block uses named ranges.



PowerScript includes an IDE with syntax checking and error messages that help you debug scripts.

Click Click
<Esc> Click
Drag Click
Crash #@!?
<Open> Click
Click <Shift>
Click Drag
Drop <Shift>
#@!?
Click Click

Click
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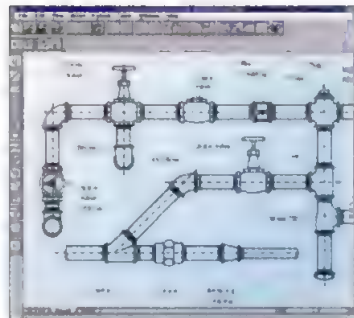
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Windows Scripting Languages

LANGUAGE ELEMENTS

We've seen this basic paradigm in other tools (for example, in Prodea Synergy, which has since been relaunched as Platinum Technology's InfoSynergy), but Prospero vastly extends the paradigm with a rich

ties, but with the connections visible on screen, it makes it easier to catch errors.

On the other hand, Prospero can make the simple more complex. If you want to repeat something four times, in BASIC you'd write for i=1 to 4 and in REXX, the elegant

do 4. With Prospero, you need to drag in and link three icons: one to define and increment the variable, one to test the condition, and one to execute the loop.

Knowledgeable programmers may find the encapsulation in Prospero too much of a good thing. But for the novice or occasional programmer, or for the harried IS programmer who needs to crank out a large number of simple integrated applications using standard programs, Prospero

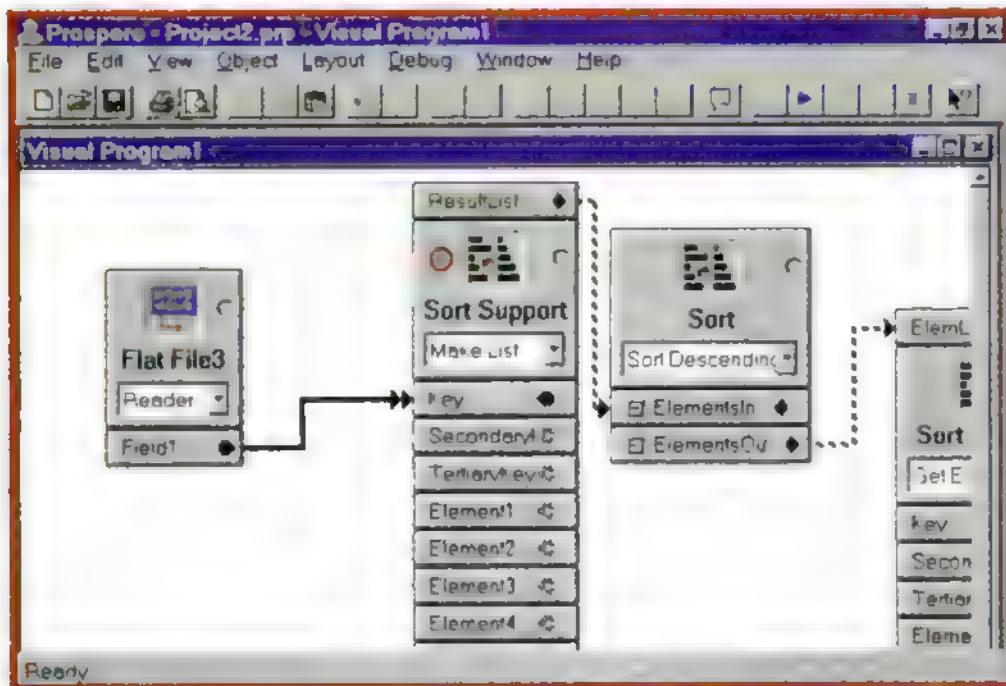
and can run any OLE automation server. SmartPad scripts can also issue DDE commands, and SmartPad itself can be controlled by other applications or by its own scripts via DDE. You can access the Clipboard, the menu commands of any application, and send keystrokes or mouse actions.

The Pro version's IDE provides a full debugger, including a watch window and interactive breakpoints. You can record macros, with keyboard and mouse actions translated into higher-level actions like menu choices. The Pro version also has a dialog-box editor; dialogs can be pasted back and forth between the code window and the dialog editor. You'll find evidence of a thoughtful design strategy throughout the product. For example, when you indicate that you want to assign a menu command, you can select the application with a mouse and have SmartPad capture the menu tree for you so that you can choose the menu item visually.

The end user triggers SmartPad actions with buttons on a SmartPad button palette. SmartPads are application-specific and can float or attach to any of the four sides of an application window. A button can have a hotkey assigned to it, and you can set auto-start, auto-end, and agent scripts to be triggered by environment changes. There is no simple way to run a script via a Windows shortcut or Start Menu item, however.

Users without access to the Pro version can assign five types of actions to a button: run an application, send keystrokes or a menu command to an application, run a recorded keyboard or mouse macro, execute a DDE command, and switch SmartPads.

Although SmartPad is generally put together well, the port to Windows 95 shows a few rough edges. When you assign a script to a button, you do so in a dialog that supports long filenames. But if the path has spaces in it, the button won't call the script unless you enter the equivalent short filename by hand. Plus, the button bars in the IDE are in desper-



Prospero's visual programming metaphor makes the flow of data in your application clear.

set of language blocks that include If-Then-Else blocks and Loop blocks. Prospero also offers a Dialog Box block whose property sheet is a dialog editor. Links to this block include the contents of the block's text fields and drop-down lists. A Windows Common Dialog block lets you implement a standard Windows look and feel. A Function block takes inputs and performs one of a variety of supplied functions. Underneath some of the blocks is explicit code in a language that extends BASIC. There is even a block that lets you supply your own code in this language.

A debug mode is included, but it is awkward to turn on and off. Instead of setting a check mark on the program's Debug menu, you have to go to a dialog off of the File menu.

PROGRAM BLOCKS

Since the purpose of Prospero is the automation of other programs, blocks that encapsulate other files and programs are crucial. Version 1.0 includes blocks for ACT!, Excel, Lotus Notes, Word, a general OLE server template, and a variety of data sources including Access, dBase, and SQL databases.

Announced for Version 1.1 (which we expect to be shipping by the time you read this) are blocks for Web pages, Microsoft Project, and a general OLE Automation template.

Prospero's approach often brings simplicity to otherwise complex tasks. It isn't terribly difficult to write the OLE automation code to transfer data from Access to Word, for example, but it is tedious and certainly forbidding for the novice. Not only does Prospero encapsulate most of these difficul-

ties, but with the connections visible on screen, it makes it easier to catch errors.

ties, but with the connections visible on screen, it makes it easier to catch errors. Prospero 1.0. List price: \$695. Oberon Software Inc., Cambridge, MA; 617-494-0990; fax, 617-494-0414; <http://www.oberon.com>. Circle 444 on reader service card.

Softblox Inc.

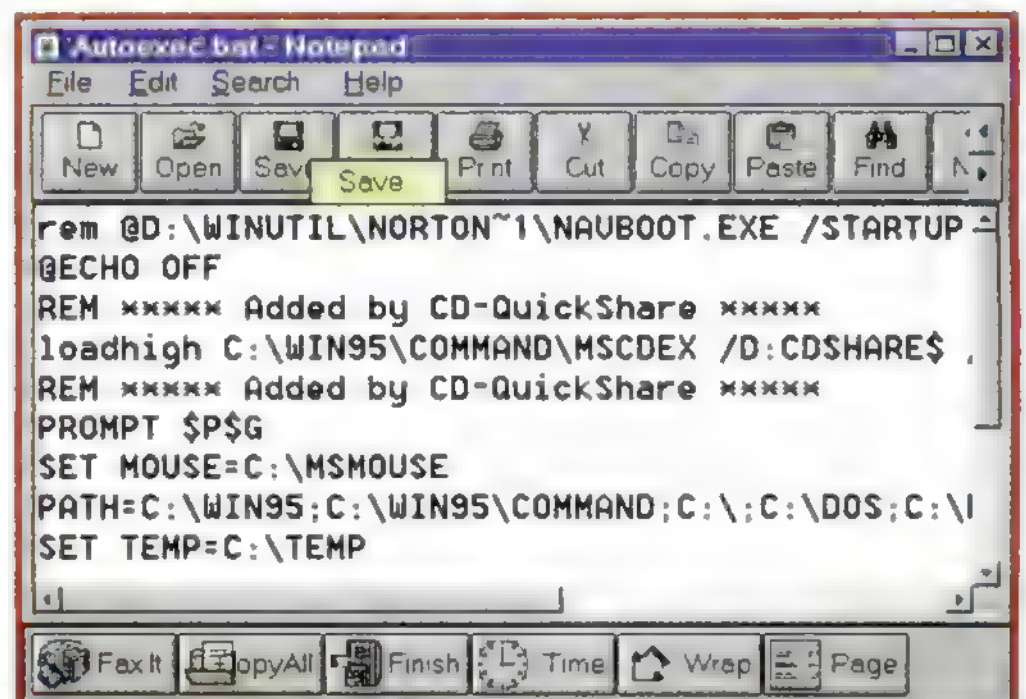
SmartPad Pro, SmartPad Desktop



Softblox's SmartPad, Version 3.5, comes in two variations: SmartPad Pro (\$495), a powerful tool for creating integrated applications, and SmartPad Desktop (\$89), a kit that allows end users to run those applications or to automate simple tasks. SmartPad Pro, which includes a full-fledged integrated development environment (IDE), proved to be the most powerful tool in this roundup.

SmartPad Pro lets you create scripts to assign to buttons in the Pro or Desktop versions. The language is a variant of BASIC, with arrays and standard control structures. Variables have types but, as in traditional GW-BASIC, need not be predeclared.

A wide variety of functions let you control Windows applications and communications between them. The scripts can be OLE Automation clients



SmartPad lets you set up many types of button pads for launching scripts, as in this makeover of Windows Notepad.

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ate need of tool tips. Even so, SmartPad is the slickest package we reviewed.

SmartPad Pro 3.5. List price: \$495. **SmartPad Desktop 3.5.** List price: \$89. Softblox Inc., Atlanta, GA; 800-434-0202, 404-892-0202; fax, 404-892-0981; <http://www.softblox.com>. Circle 445 on reader service card.

SmartDesk Inc.

Virtual Desk

SmartDesk's Virtual Desk, Version 2.01 (\$49.95), seems more like a way of life than an automation tool. With it, your desktop becomes a live environment in which you can place objects that react to a rich scripting language. But for conventional application integration, we found that slow performance and a few rough edges



Virtual Desk makes your desktop come alive with objects. The default Virtual Desk is shown here.

make Virtual Desk less than ideal.

The program ships with numerous pre-made environments with links between them. Environments include Main Street, Office, Library, Message Board and Newsstand. Each comes with an appropriate bitmap for wallpaper, and those bitmaps have objects, such as a desktop calculator in the Office environment.

From each object's property sheet, you can assign scripts to a variety of actions including click, double-click, and drag-and-drop. The scripts can be accessed through buttons on the property sheets that open the script in the program's IDE.

Virtual Desk's IDE has a debugger that includes breakpoints and a watch window, but lacks some of the bells and whistles found in the SmartPad IDE. For example, while you can access Help for the language, you can't paste function templates directly into your code. Virtual Desk also lacks a dialog-box editor, but it does have a command-line interpreter, into which you can type scripting commands to see what they do.

The language syntax, with constructs like for (i=1; i<=cnt; i++), is reminiscent of C,

although the control structures and on-the-fly typing are more like BASIC. Some of the language's most intriguing commands manipulate Virtual Desk's objects. For example, you can build a script that concurrently creates a new object (say a note) and sets up the script that runs when you click on that object. Functions for manipulating files exist, but OLE automation, DDE, and controlling menus in other programs is not supported (although you can send keys and mouse actions to other programs). Virtual Desk even lets you automate your household appliances (!) via the X-10 protocol

using a special device on your serial port and special receptacles in your electric outlets.

On our test system, which had 64MB of RAM, Virtual Desk in its default setup had a noticeable impact on performance. We also found rough edges in the documentation and Help system. Some of the Help choices in the IDE sent you to nonexistent topics, and the list of functions in the printed documentation and in the Help system didn't match. Virtual Desk's scripting language is well tailored for its own environment, but its limited ability to drive other ap-

plications make it less appealing as a general automation tool.

Virtual Desk 2.0. List price: \$49.95. SmartDesk Inc., Laguna Hills, CA; 800-582-4022, 714-582-4020; fax, 714-348-0006; <http://www.virtualdesk.com>. Circle 446 on reader service card.

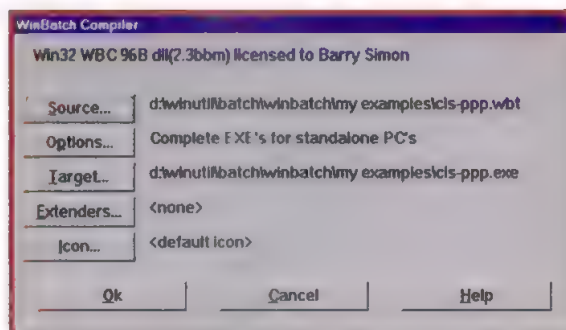
Wilson WindowWare Inc.

WinBatch, WinBatch+Compiler



WinBatch is the grandfather of Windows batch packages; its Windows Interface Language (WIL) was introduced at the same time as Windows 3.0. Today, the shareware WinBatch 96B (\$99.95) is a powerful and sophisticated 32-bit scripting language available for Windows 95 and Windows NT. (Other supported platforms include Windows 3.1, and Windows NT on Alpha, Mips, and PowerPC.) The WinBatch+Compiler (\$495) lets you compile WIL scripts into executables that can be freely distributed.

WIL the language has considerable power



The WinBatch+Compiler lets you compile scripts into standalone executables that can be freely distributed.

and flexibility but suffers from occasional inelegance. It lacks true arrays, dealing instead with tab-delimited strings (for example, the FileItemize function returns a tab-delimited string with the names of files meeting a given file specification). The ItemCount and ItemExtract functions are useful for manipulating such strings, although this approach is awkward for multidimensional arrays and will ultimately make a language purist wince. Still, it works in the context of scripts.

WIL has a wealth of built-in functions for interacting with Windows applications, including the ability to send keystrokes and menu choices. Its only recording capability, however, is for keystrokes. WinBatch offers a bare-bones debug mode that lets you single step and get the value of any variable you type in but provides no formal watch window, no jumping over subroutines, and no formal conditional breakpoints. (You can simulate the breakpoints using code like `if j==2 then debug(@ON.)`) A dialog-box editor is provided.

WinBatch scripts are text files with the extension .WBT; you can run them by double-clicking on the file icon. As long as the WinMacro program is active, you can also run scripts via hotkeys or from selections added to an application's system menu. You can add scripts to the context menu of files viewed in Explorer or located on the desktop, or you can define a menu of batch files to run from an icon in the notification area of the Windows 95 Taskbar.

The WinBatch+Compiler lets you make standalone .EXE files and distribute them to those who don't have WinBatch, making the WinBatch+Compiler an attractive and economical option for corporate IS departments. Overall, WinBatch is one of the most powerful automation tools for Windows 95 around.

WinBatch 96B. Shareware registration fee: \$99.95. **WinBatch+Compiler.** List price: \$495. Wilson WindowWare Inc., Seattle, WA; 800-762-8383, 206-938-1740; fax, 206-935-7129; <http://www.windowware.com/>. Circle 447 on reader service card. □

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By Jeff Prosis

Java Programming for the Web

This hot new language is making the Web even more interesting.

Computer languages come and go, but few have made an impact so quickly—or so profoundly—as Java, the new programming language from Sun Microsystems. Unless you’ve been marooned on a desert island for the past several months, you’ve probably heard of Java. It’s similar to C++, but it’s syntactically cleaner, less expansive in scope, and easier to learn. More important, it’s vying to become the official programming language of the World Wide Web.

With Java, it’s relatively easy to create an HTML document that displays a continuously running animation in a panel at the bottom of the page or that draws a bar chart from information typed in by the user. It’s even possible to create monolithic applications (think Word and Excel) that are accessed via URL addresses and “run” with your Web browser. Java programs execute locally, so they take advantage of a host computer’s processing power without increasing the load on remote Web servers. And because the language is platform-independent, a program written in Java works equally well on a Sun workstation, a PC running Windows 95, a Macintosh, or any other computer for which a Java-enabled Web browser is available.

So what is this thing called Java? What does it look like? How are Java programs embedded into Web pages, and how will Java change the way we use the Web? Here’s a high-level overview of the language and of some of the ways in which it is already being put to use.

JAVA THE LANGUAGE

Java was created in the early 1990s by a team of developers at Sun Microsystems whose mission involved writing real-time embedded systems software for consumer electronics products. After struggling to overcome some of the limitations of C++, the team decided to change the language rather than change the way they wrote software. The original Java borrowed heavily from C++ as well as other

object-oriented programming languages such as Objective C and Smalltalk. Internet-specific features were added later, around 1993.

Java’s rise to stardom began in early 1995, when Netscape announced that Navigator 2.0 would run Java programs embedded in Web pages. The idea was to give HTML authors a means for creating interactive documents that could be viewed with Java-enabled Web browsers. Programmers would write Java programs, called “applets,” and compile the

including strings and arrays. Objects are modeled in classes that combine data (properties) and functions (methods) under one roof, so that each object can implement its own characteristics and behavior. As in C++, classes can be built from scratch or derived from pre-existing classes. Derived classes inherit the methods and properties of their ancestors.

Objects in Java are created with the new operator, which is similar to C++’s new operator. The following statements create an object from a class named Window and then call the object’s show method:

```
Window myWindow;  
myWindow = new Window ();  
myWindow.show ();
```

This simple code fragment highlights a couple of important differences between Java and C++. In C++, the statement

```
Window myWindow;
```

creates an instance of Window on the stack frame. Stack-based objects aren’t supported in Java, so the statement creates a variable named myWindow that holds a reference to a Window object. myWindow initially contains a null reference, but the statement

```
myWindow = new Window ();
```

creates an object and copies a reference to that object to myWindow. Note the syntactical differences between the two languages’ use of the keyword new. In C++, new returns a pointer to an object; in Java, it returns a reference. There’s no such thing as a pointer in Java, so you’ll never come across a statement like this one:

```
myWindow->show ();
```

The absence of pointers prevents a program from accessing memory it doesn’t own. It also eliminates some of the most common causes of programming errors in C and C++.



FIGURE 1: Gamelan is a Web page dedicated to Java development. It will spawn new browser windows to show you hot new Java applets from sites all over the Internet. Shown here is an applet that illustrates the effects of changing the altitude of an object orbiting the earth.

applets with a Java compiler (Figure 1). The compiled code, or byte code, could then be referenced by a URL in an HTML document and executed by a byte-code interpreter built into the Web browser. Theoretically, this unusual marriage of a compiler and an interpreter would give Java both the speed of a compiled language and the portability of an interpreted one, since byte code could be machine-independent. It would also enhance security, because the interpreter could validate each byte code before executing it (Figure 2).

As a language, Java bears a strong resemblance to C++. Java is object-oriented through and through, and with the exception of variables created from primitive data types such as int and float, everything is an object,

(For a quick look at other differences between Java and C++, see the sidebar "Java and C++: Twin Sons of Different Mothers?")

An important part of any object-oriented programming language is a class library containing prewritten code. In Java, class libraries are called "packages." Java provides a standard set of classes for programmers to work with called the Java API Packages. The packages go by names such as `java.util` and `java.awt` and are "imported" into a program with the `import` keyword. The statement

```
import java.awt.*;
```

imports all the classes that are part of `java.awt` and is roughly equivalent to writing

```
#include <awt.h>
```

in a C++ program. `java.awt` is the API package containing classes for windows, menus, dialogs, and other user-interface objects; the "awt" in the package name stands for "Abstract Window Toolkit." One API package, `java.lang`, contains classes for strings, threads, and other fundamental object types and is automatically imported into every Java program.

APPLETS, APPLICATIONS, WEB PAGES

One of the unusual aspects of Java is that it makes a distinction between "applets" and "applications." An applet is a program designed to be included in an HTML document and run inside a Web browser. An application is a standalone program that's executed outside of a Web browser. Any compiled class with a function called `main` can be run as if it were an application. A simple class that prints "Hello, world" on

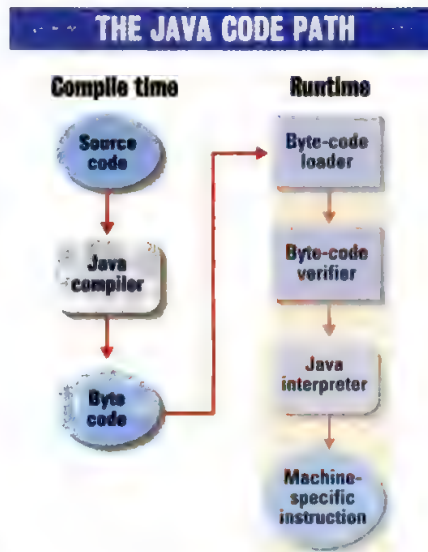


FIGURE 2: Java programs are compiled to an intermediate stage called byte code, and byte code, which is platform-independent, is translated into machine-specific instructions at runtime by an interpreter. Before each byte code (or sequence of byte codes) is executed, it is passed through a verification engine to ensure that it adheres to the rules and security restrictions of the language.

the screen can be written like this:

```
class HelloApp {
    public static void main (String
        args[]) {
        System.out.println ("Hello,
            world");
    }
}
```

When this class is executed, the Java interpreter calls its main function, and `main`, in turn, writes "Hello, world" on the screen. `println` is a method belonging to the Java `PrintStream` class, and `System.out` is a static variable that contains a reference to a `PrintStream` object. `System` is one of the Java API classes included in `java.lang`.

Applications are interesting, but applets are even more interesting, because you can build dynamic Web pages from them. The basic functionality of an applet is modeled in the `Applet` class that is part of the `java.applet` package. Applets perform their output through objects created from the `Graphics` class defined in `java.awt`. (If you're familiar with Microsoft's MFC library for Windows programming, Java's `Applet` and `Graphics` classes are roughly analogous to MFC's `CWinApp` and `CDC` classes.) Here's what the applet equivalent of the previous paragraph's "Hello, world" application looks like in its source code form:

```
import java.awt.*;
import java.applet.*;

public class HelloApplet extends
    Applet {
    public void paint (Graphics g) {
        g.drawString ("Hello, world", 8,
            8);
    }
}
```

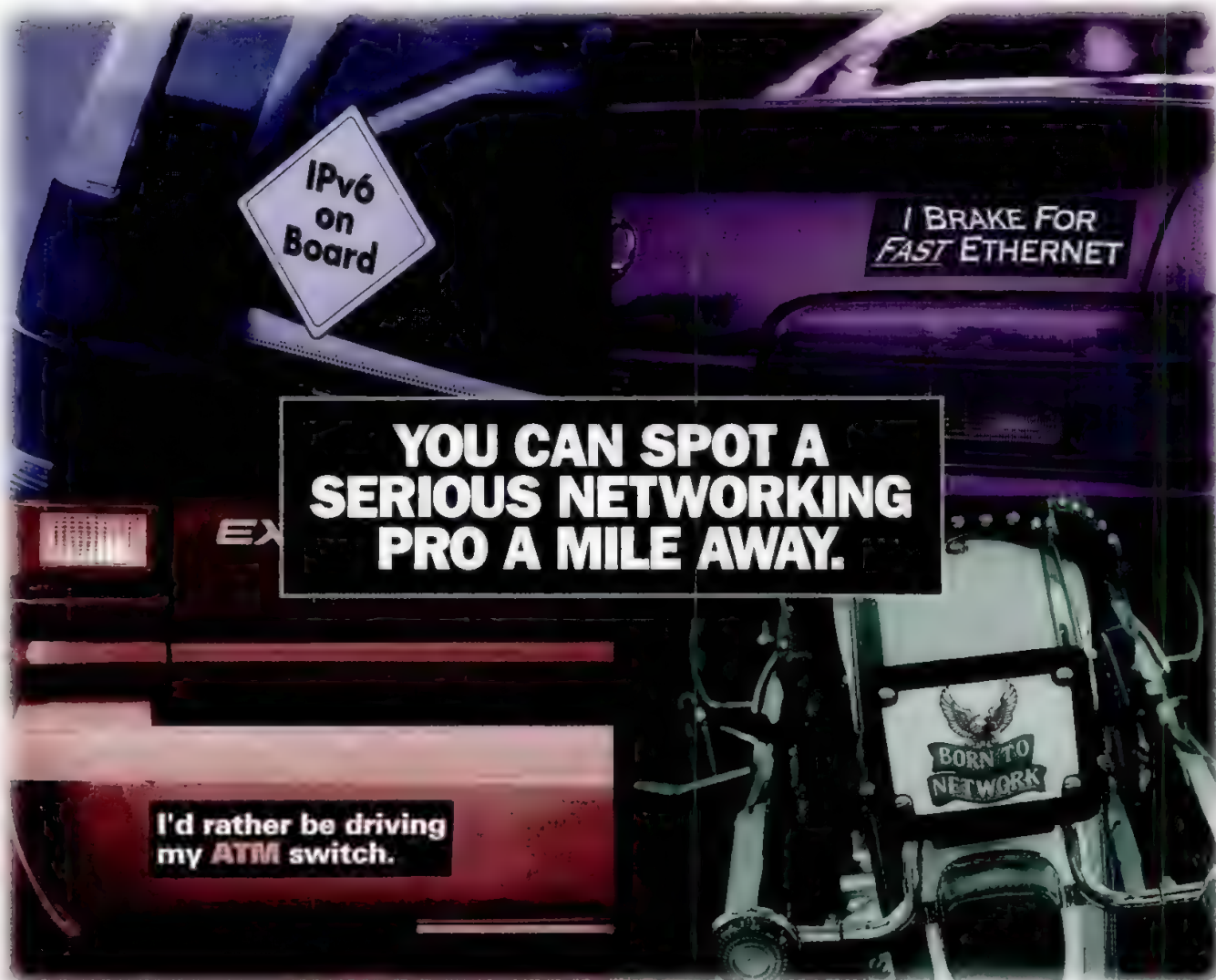
The class `HelloApplet`, which is derived from `Applet`, defines the applet's behavior. `HelloApplet` overrides the `paint` method it inherits from `Applet` and uses the `drawString` method of the supplied `Graphics` object to

Java and C++: Twin Sons of Different Mothers?

Java and C++ may be more alike than different, but Java's proponents feel that several key differences between the languages make Java easier to learn and an easier environment in which to write programs. A complete list is beyond the scope of this article, but read on for some of the more notable differences between the two languages:

- C++ supports multiple inheritance; Java does not. Java does, however, permit a class to inherit multiple interfaces, which are similar to abstract base classes in C++. According to Java's creators, interface-based inheritance provides most of the benefits of C++-style multiple inheritance while avoiding many of its pitfalls.
- In Java, all functions and variables must be part of a class. By contrast, C++ allows functions and variables to be declared globally just like C.
- All objects in a Java program are created on the heap with the `new` operator—they are never created on the stack. Java is also a garbage-collected language, so it's not necessary to counter each `new` with a `delete`—a common source of memory leaks in C++ programs. In fact, there is no `delete` operator in Java.

- Java does not support templates, nor does it support operator overloading.
- Java has no preprocessor and therefore doesn't support preprocessor macros. This has the very pleasant effect of eliminating the obfuscated (though often useful) code produced when C and C++ programmers rely too heavily on `#define` macros.
- There are no pointers in Java. The `new` operator returns a reference to an object that is similar to a reference in C++. The lack of pointers eliminates the need for tricky pointer arithmetic and virtually ensures that a program can't attempt to access memory it doesn't own.
- Java does not support default function arguments as C++ does.
- Java makes multithreading part of the language by including a `Thread` class that encapsulates threads of execution. Java also provides a high-level mechanism for synchronizing the actions of two or more threads attempting to access the same object at the same time. It's possible to write multithreaded programs in C++, but only if you call threading functions built into the operating system.



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draw "Hello, world" on the screen. paint is called when the applet needs to update its "window"—the rectangular area it occupies on the Web page. This draw-on-demand model closely parallels the one used by Windows, the Macintosh OS, and other windowed operating environments. Java's Applet class includes numerous other methods that can be overridden to do other useful things. To a large extent, just which methods an applet overrides (and what it does in those overrides) gives the applet its unique personality.

When HelloApplet is compiled, the Java compiler creates a class file named HelloApplet.class containing the applet's byte code. The applet is added to an HTML document by specifying the name of its class file in an <APPLET> tag, as shown below:

```
<APPLET CODE=HelloApplet.class
  WIDTH=100 HEIGHT=100>
</APPLET>
```

WIDTH and HEIGHT specify the dimensions of the rectangle in which the applet is displayed—in this case, 100 by 100 pixels. CODE identifies the class file that contains the applet's compiled code. (An <APPLET> tag can include other attributes not shown here.) In this example, HelloApplet.class must be stored in the same directory as the HTML file for the Web page. When the browser encounters the <APPLET> tag, it loads the HelloApplet object from HelloApplet.class and calls the object's int method to start the applet running. Soon after, it calls the applet's paint method, instructing the applet to paint itself on the screen.

HelloApplet doesn't do anything very useful (unless you consider drawing a string of text useful), but it's possible to do much more. Some applets contain thousands of lines of code. In less than 50 lines, you can write an applet that executes a simple animation loop by repeatedly drawing bitmap images.

Applets can also create menus, push buttons, scroll bars, and other user-interface objects as a means of interacting with the user. For a demonstration of the fun kinds of things one can do with Java applets, visit Sun's "Cool Java Applets We've Written" Web page, at <http://java.sun.com/applets/applets.html>. You must be using Netscape Navigator 2.0 if you wish to view the applets, but you can download the applets' source code with any browser. For a glimpse at some real Web pages that make creative use of Java applets, check out the list at <http://java.sun.com/applets/pastFeaturedPages.html>.

LEARNING MORE ABOUT JAVA

If you're interested in learning Java, the first thing you should do is visit the Java home page at <http://java.sun.com> and download the Java Developer's Kit (JDK) and the documentation that goes with it. Java development tools will soon be available from other vendors (including Microsoft), but at this writing, the Sun JDK is the only game in town. There are three versions: one for Windows 95 and Windows NT, a second for the Macintosh, and a third for Sun Solaris. It's important to download the version that matches the system on which you'll be doing your development. But once it's compiled, an applet built with the JDK will run on any system for which a Java browser is available.

The JDK comes with the Java API packages as well as source code for a variety of sample programs. It also contains the following tools:

- The Java compiler (*javac*)
- The Java interpreter (*java*)
- The Java applet viewer (*appletviewer*)
- The Java debugger (*jdb*)

The Java compiler compiles Java source code (.java) files into .class files. The Java interpreter runs Java applications, and the Java applet viewer runs Java applets in a simulated Web browser. The sample applets included in the JDK's demo directory can be viewed by typing appletviewer followed by the name of the corresponding HTML file, even if you

**To put it simply, Java
gives Web authors more
freedom than ever to
express ideas.**

don't have a Java-enabled Web browser on your PC.

Numerous books on Java programming are available—some good, some bad. I hesitate to make any recommendations, because I've only had the chance to read two of them. The Java series from Addison-Wesley looks promising, but so far I've yet to see a Java book I would consider definitive.

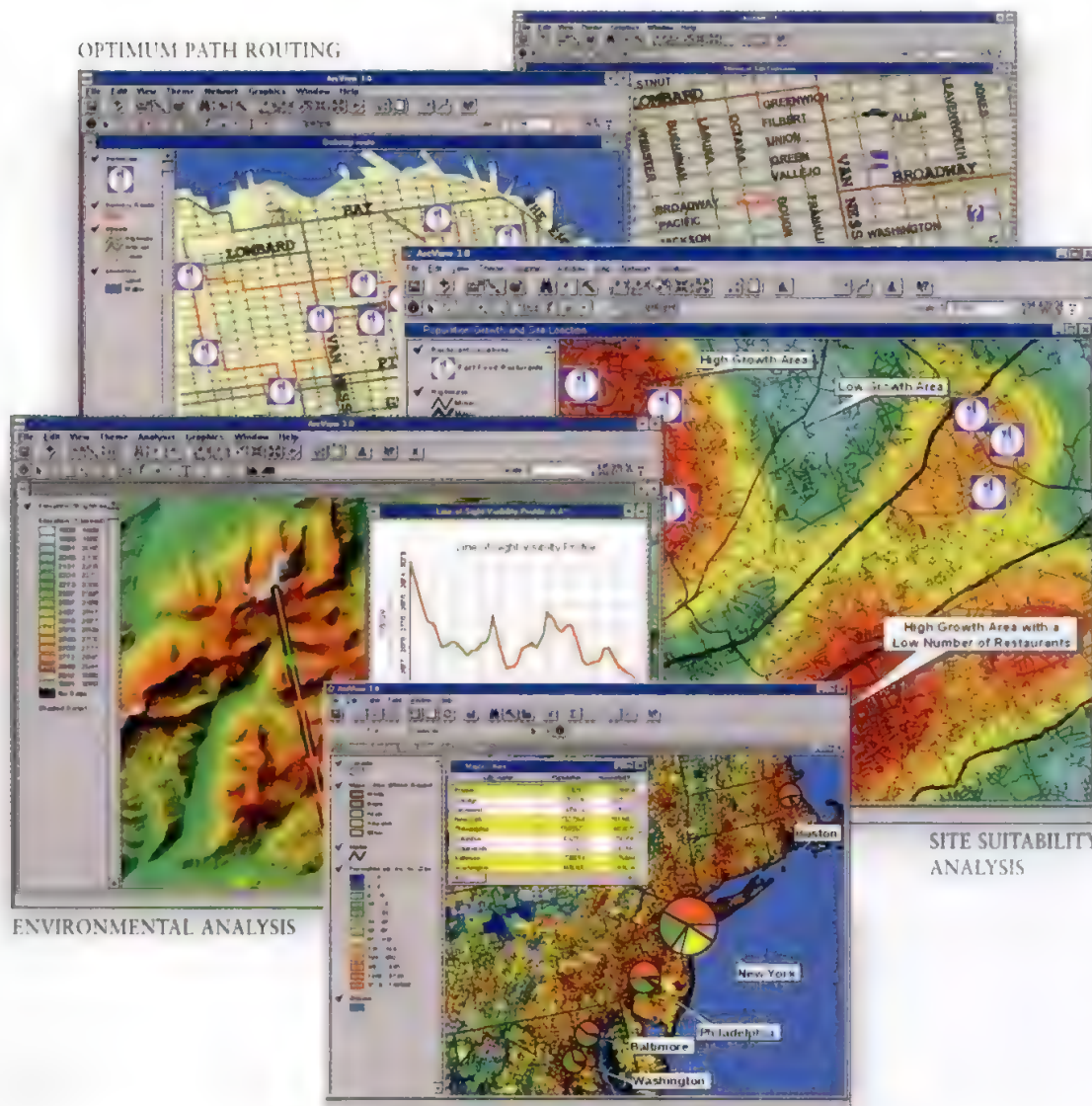
What impact will Java have on the Web? Put simply, Java gives Web authors more freedom than ever to express ideas. Web pages no longer have to be static objects that rely on server-side scripting to provide even the most rudimentary responses to user input; instead, they can do virtually anything a real application program can do. Already, Java-enabled Web pages exist that estimate taxes, provide up-to-the-minute stock prices, play musical Christmas greetings, and challenge users to a game of Solitaire. Thanks to Java, the Web is becoming an increasingly fun place to be—and the fun is only beginning. □

Jeff Prorise is a contributing editor of PC Magazine.

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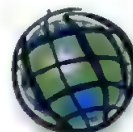
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CIRCLE 385 ON READER SERVICE CARD



PC Tech/Power Programming

By Gyorgy Grell and Paul Modzelewski

A DirectDraw Game in C++

A practical look at Microsoft's new high-speed graphics API.

The previous Power Programming column gave an overview of what DirectDraw does and how to use it ("Using DirectDraw with C++," June 25, 1996); now it's time for a more practical look at Microsoft's new high-speed graphics API for Windows 95. In this article, we'll discuss the reusable C++ classes we devised to encapsulate DirectDraw and the game we created using those classes (Figure 1).

Our main goal in developing the game was to demonstrate that DirectDraw and C++ make an excellent team for multimedia programming. We have created a number of classes, mostly based on the Microsoft Foundation Classes (MFC). A basic understanding of Windows programming, MFC, and C++ is assumed.

THE FRAMEWORK

The basis of our game is contained in two classes and their descendants: `CGameApp` and `CGameFrame`. We decided to get rid of the document and view classes created by Microsoft Visual C++'s AppWizard, since

we didn't need the overhead of the document/view architecture. `CGameApp` is a standard `CWinApp` descendant. Instead of creating a document template that would create the main window, we directly create a `CFrameWnd` ourselves in `CGameApp`'s `InitInstance` function.

```
m_pMainWnd = GetNewFrame();  
ASSERT(m_pMainWnd != NULL);  
m_pMainWnd->  
ShowWindow(SW_SHOWNORMAL);
```

Notice the call to `GetNewFrame`, a virtual function that creates a new instance of the current application's main window class. This will come into play when we create our own descendants of `CGameApp` and `CGameFrame`.

The most important function of our application class is `Run`, which is called by standard MFC processing after all application initialization has finished. In `Run`, we do any game initialization and then loop until the `PumpMessage` function returns `TRUE`, the signal that the application should quit. We

use `PeekMessage` to check for any queued messages; if it returns `TRUE`, `PumpMessage` takes an existing queued message and forces it through MFC's processing:

```
if (::PeekMessage(&m_msgCur, NULL,  
NULL, NULL, PM_NOREMOVE))  
{  
    // pump message, but quit on WM_QUIT  
    if (!PumpMessage())  
    {  
        GetGameFrame()->KillGraphics();  
        GetGameFrame()->DestroyWindow();  
        return ExitInstance();  
    }  
}
```

The next part of the `Run` loop is where we call `CGameFrame`'s `UpdateGame` function, which updates the game internals, performs the rendering, and flips the video pages:

```
if (m_bPlaying)  
{  
    if (!GetGameFrame()->UpdateGame())  
    {  
        StopPlay();  
        PostQuitMessage(0);  
    }  
}  
else  
{  
    ::WaitMessage();  
}
```

You will see that the real meat of `UpdateGame` is actually in `CSpaceFrame`. `StartPlay` and `StopPlay` are two other important functions for restarting and pausing the game. In `CGameFrame`'s `ActivateApp` function, you'll notice that we call `StopPlay` when the application loses focus and `StartPlay` when it gains focus. You'll notice that `StopPlay` sets `CGameApp`'s member `m_bPlaying` to `FALSE`, which will prevent `UpdateGame` from being called. When the application gains or loses focus, `OnActivateApp` is called: This is where `CGameApp`'s `StartPlay` and `StopPlay` are called. When the application loses focus, we call `StopPlay`, and when it gains focus, we call `StartPlay`; thus the application will not take

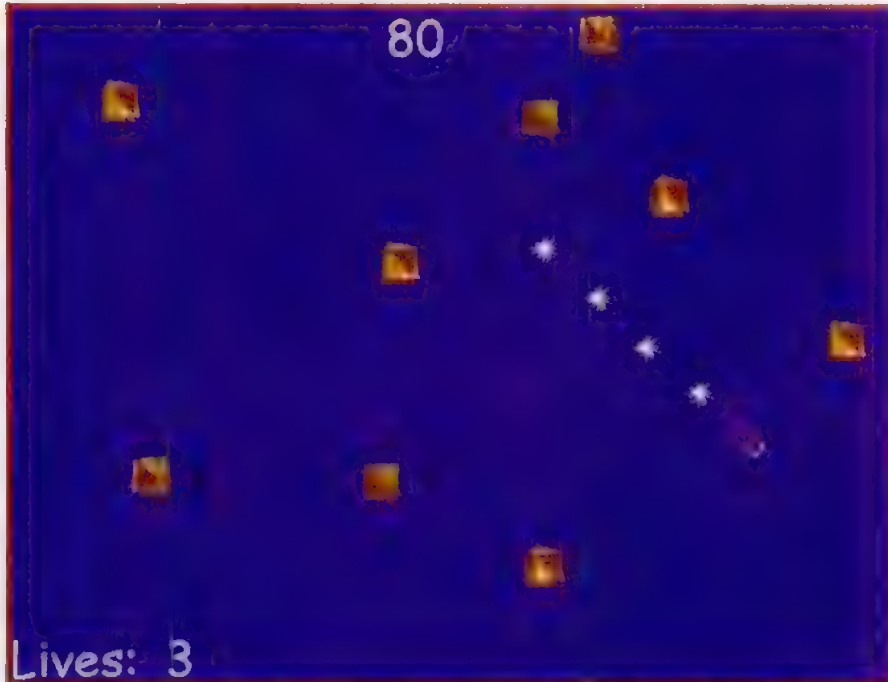


FIGURE 1: This Asteroids-style program uses DirectDraw to speed display performance.

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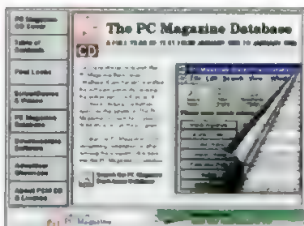
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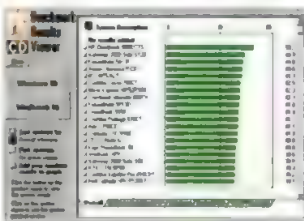
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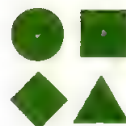
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up any cycles when it is in the background.

CGameFrame encapsulates our main window creation and functionality. It includes the basic data members needed by all game applications: a DirectDrawSurface that points to the main flipping surface (m_pFrontBuffer), a pointer to our drawing surface (m_pBackBuffer), and our palette for the game (m_pGamePalette). As we noted in the first article, all rendering is done on the drawing surface, which is then flipped into view for smooth animation.

We create the main window in the constructor. First we register our own window class using AfxRegisterWndClass in order to change the default cursor, icon, and background brush. We set the cursor to NULL so that it won't show up; the icon is loaded from the resources, and the background brush is set to black so that the main window will be less obvious before our first page flip. Next we create the window using CreateEx. Note that we create windows with different attributes for debug and release versions. We found that using a small, overlapped window would allow us to debug the application more easily, whereas in release mode, the window is a topmost, pop-up window whose size is set to the screen's resolution. Why do we use the window style WS_SYSMENU? Because we want our game to show up on the Taskbar when we switch to another application; if we don't give the window the WS_SYSMENU style, the Taskbar won't show the application's icon.

The InitGraphics function contains all the setup and initialization of DirectDraw that we talked about in the first part of this article. Another essential function is RestoreSurfaces, which is needed after a switch to another application. When a switch occurs, GDI regains its control over video memory. Therefore, when our game resumes, we need to call RestoreSurfaces on all our surfaces to reclaim their video memory and then copy images back onto the surfaces if needed.

Since we create the main window with the WS_SYSMENU style, the window has a menu. Because of this, if the user were to press the Alt key, the game would stop and the system menu would get focus. But we might want to use the Alt key for control. In order to allow that, we created the OnSysCommand function, which catches and discards menu keys (Alt or F10), passing on any other keystrokes to the default message handler.

ANIMATION

In addition to the MFC-derived classes, we wrote CAnim, a straight C++ class to handle animation under DirectDraw. This class has no dependencies on MFC, and removing the #include "stdafx.h" from the beginning of animation.cpp will allow you to use it in any

The best way to debug a DirectDraw application using Microsoft's Developer Studio is to implement the remote debugging feature using a second computer. Of course, most of us have only one computer available, so fortunately, we discovered a simple way to debug our application.

When compiling the application in debug mode, the window style will be such that it is possible to step through most of the application, except for code between the DirectDrawSurface Lock() and Unlock() function calls. During debugging,

DirectDraw program. The following snippet shows how you would typically construct a CAnim:

```
m_pShipAnim = new CAnim(m_pDD, "ship",  
"media/", 32);
```

The first parameter is a pointer to the application's DirectDraw object. The second and third parameters tell the application where to find the bitmap files that contain the individual frames. The second parameter is the root of the filenames, each of which must consist of three elements: a four-character root identifying the group to which the frame belongs,

The actual
implementation of
Update game is fairly
simple, since all the
complex work is farmed
out to helper functions.

followed by a zero-padded, four-digit identifier indicating the frame's position in the animation sequence (starting with 0000), and a .BMP extension. The third parameter is the directory in which the files are located. The fourth parameter is the number of frames in the animation, and a fifth parameter is a Boolean that defaults to TRUE; this parameter determines whether CAnim will attempt to load the images into video memory. If there is not enough video memory to store the images, they will go into system memory. Likewise, if the fifth parameter is explicitly set to FALSE, then the images will be loaded

Debugging Tips

we place a breakpoint on the first line of the InitGraphics() function. On reaching that point, we step the debugger through each line of code until we get past the SetDisplayMode() code. Since we step through each line individually, DirectDraw will not take over GDI to such an extent that we cannot even see the debugger. At this point, you may need to maximize your main window, since the screen resolution will have changed. From here on, you'll be able to place breakpoints in the code and actually have the debugger window be visible.

into system memory. The above snippet would load the files ship0000.bmp to ship0031.bmp from the subdirectory media and store the images in video memory if space is available. It is important to make sure that all the images in a given animation have the same height and width.

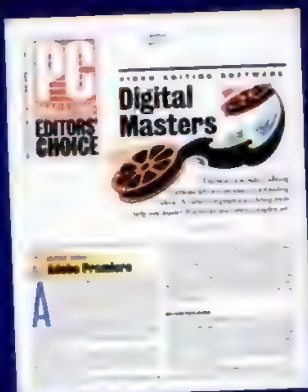
Constructing a CAnim does not load the images or allocate memory for image storage; all of that actually happens in the Load function, so you must call the Load function before using a CAnim. The Load function actually calls the protected member function CAnim::InternalLoad, which is also called by CAnim::Restore. The InternalLoad function creates a single DirectDrawSurface, onto which all the individual images in the animation are blitted in a grid. CAnim::Render then indexes into that grid based on the number of the frame to be drawn. Here is the prototype for CAnim::Render:

```
HRESULT Render(int nX,  
int nY,  
int nFrameNum,  
LPDIRECTDRAWSURFACE  
pDestSurface,  
BOOL bTransparent = TRUE);
```

The first two parameters are the X and Y coordinates in pixels of the top-left corner of the animation. The third parameter is the number of the frame to be drawn, followed by the destination surface (usually the back buffer). The final parameter is used to set the transparency of the blit operation and defaults to TRUE, or transparent. The return value is the HRESULT from the destination surface's BltFast function. The primary reason for returning this value is to determine if the surface has been lost. You should always compare the returned HRESULT with DDERR_SURFACELOST, and restore *all* of your surfaces if they match.

Restoring the surface of a CAnim is as easy

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as calling the `Restore` function. `Restore` will first call `IDirectDrawSurface::Restore` on the surface that it owns, getting back the surface's memory. `Restore` then calls `CAnim::InternalLoad(TRUE)`, which will re-copy the image files into the newly restored surface. `CAnim::Release` simply calls `IDirectDrawSurface::Release` on `CAnim`'s surface, and this should be done prior to destruction of the C++ object. (Forgetting to call this function usually won't matter, since the main `DirectDraw` object releases all the surfaces and palettes it has created when it is released, but explicitly calling it is good programming practice.) `CAnim` also has three getters—`GetNumFrames`, `GetWidth`, and `GetHeight`—whose usage is self-explanatory.

THE GAME

Our game is simple and doesn't need a lengthy explanation. You are the purple ship; shoot all the boxes on the screen to progress to the next level, where you will have to destroy even more boxes. Run into a box and you lose a life. Lose three lives and the game is over. The Left and Right Arrow keys rotate your ship, the Up Arrow accelerates, the Down Arrow stops the ship, Ctrl fires, and Esc quits the game. The number at the top of the screen is the current frame rate of the game in frames per second. This is just an indication of how smoothly the game will animate; the user has no control over frame rate.

In order to run the game, you must have the Games SDK runtime files on your system. They are installed by any game that uses the Games SDK, so if you have already installed such a game, you'll be able to run the program. To compile the sample code, you will need Visual C++ 4.x and the Games SDK, which is now included in MSDN Level II and in Visual C++ 4.1.

So where is all the game-playing code? We decided to use the features of C++ and create some classes that are descended from our existing frame and application classes. That way we could break out generic work into `CGameApp` and `CGameFrame` and place our game-specific code into `CSpaceApp` and `CSpaceFrame`. We probably could have broken it out even further, but we didn't want to go crazy with OOP-ness. You'll notice that `CSpaceApp` consists only of `GetNewFrame` and the global object `theApp`. We decided not to put this code into `CGameApp` so that it would be clear where the generic code ends and the game-specific code begins.

`CSpaceFrame` uses `CGameFrame` as the base of its functionality, overriding several key virtual functions, and adding quite a few non-virtual functions specific to the implementation of our game. `CSpaceFrame::InitGraphics` first calls `CGameFrame::InitGraphics`, which sets up our `DirectDraw` object, sets the graph-

ics mode, creates our primary flipping surface, and calls `InitPalette`. `CSpaceFrame::InitGraphics` then creates two `DirectDrawSurfaces`, one for displaying the frame rate and another for any other text that we display on the screen. We also construct and load all of the `CAnims` that we use in the game here. The `Restore` function in `CSpaceFrame` calls `CGameFrame::Restore` to restore the primary surface's memory, then restores the frame rate and text surfaces, as well as calling `Restore` on all of the `CAnims`.

In order to handle game processing, `CSpaceFrame` also overrides `UpdateGame`. There is no need to call the base class version of `UpdateGame`, since it simply returns `TRUE`. This is essentially our main game loop, called at regular intervals by `CGameApp::Run`, and it is really the guts of our game. The actual implementation of `Update-`

There are many exciting ways to use the power of C++, particularly when combining Visual C++ with DirectDraw.

Game is fairly simple, since all of the complex work is farmed out to helper functions. The essence of the process is as follows:

- Move the sprites.
- Check for collisions.
- Fill the screen with black to erase the previous frame.
- Draw the sprites.
- Flip pages.

We used a classic doubly linked list of structures to represent sprites. Here is the definition from `SpaceFrame.h`:

```
typedef struct _SPRITE
{
    struct _SPRITE* pNext;
    struct _SPRITE* pPrev;
    SpriteType      eType;
    double          dPosX, dPosY;
    double          dVelX, dVelY;
    int              nDirection;
    int              nFrame;
    int              nDelay;
    CAnim*           pAnim;
} SPRITE;
```

The first two variables are pointers to the next and previous sprites in the list, and the list wraps, so `pNext` of the last sprite points to the head of the list, and `pPrev` of the head points to the last sprite. The `eType` member is

used to determine what type of sprite is represented by a given node; the possible values are `typeShip`, `typeEnemy`, and `typeBullet`. The `nDelay` variable is used to slow the rate at which enemies and bullets are animated and controls the rate at which bullets are fired by the ship.

Several functions in `CSpaceFrame` are used to handle the sprite list. `MoveSprites` loops through the entire list of sprites, changing position, velocity, and frame number information as necessary. Each type of sprite is handled slightly differently; for example, when updating the ship, `MoveSprites` polls the keyboard to determine the sprites' movement. `CollideSprites` contains all of the collision-detection code, and behaves somewhat like `MoveSprites` in that it loops through the list and processes each type of sprite in a slightly different manner.

When a collision occurs, `CollideSprites` takes the appropriate action, depending on the types of sprites involved. `DrawSprites` is used to draw all the sprites onto the back buffer. It loops through the entire list, calling the `Render` member function of the `CAnim` owned by each sprite. The functions `AddSprite` and `RemoveSprite` are used to add and remove sprites dynamically from the list, and `m_head` is the head of the list and the player's ship, which we store on the stack.

You can download the game and all of the source code from PC Magazine Online (see the sidebar "Guide to Our Utilities" in this issue's Utilities column for downloading instructions). If you want to build the application, here's how:

- Unzip the archive using `-d` to keep the hierarchy structure intact.
- You need Visual C++ 4.x to compile the app. The debug build uses the DLL version of MFC (for faster links), and the release version uses the static linking MFC.
- The `DirectDraw` lib and header directories need to be added to the search path through Tools | Options... under the Directories tab. The `MEDIA` subdirectory contains all of the sprite bitmaps.

There are many exciting ways to use the power of C++, particularly when combining Visual C++ 4.x with `DirectDraw`. Since `DirectDraw` and all the other components of the Games SDK are based on COM objects, they lend themselves to C++ encapsulation rather easily. We hope the code included with this article will speed you along your way. □

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PC Tech/Internet Tools

By Linden deCarmo

Java and Digital Audio: An Excellent Brew

Our applet shows Java's multimedia and cross-platform capabilities.

The Java language has garnered so much publicity in the last year, you might think it contains the secret to the lost island of Atlantis. Why all the excitement? Well, Java promises to run the same multimedia application on a multitude of operating systems—in the computer world, that's a very big deal indeed.

Does Java live up to its promise? To explore this question as it relates to audio applications, I created *JavaTime*, a Java clock applet that exercises Java's audio capabilities by synchronizing the movement of clock hands with an audio effect and that simultaneously uses threads for audio alarms. We'll use *JavaTime* in this article to illustrate how you can use Java multimedia, uncover limitations in Java's audio support, and explore future directions in Java's multimedia capabilities.

Before delving into Java multimedia, you need to be familiar with the basics of Java programming. Because we'll be focusing on Java audio and not the Java language, you might want to check out some sources for Java fundamentals. "Java & HotJava: Waking Up the Web," from our Internet Working column of October 24, 1995, is an excellent introduction to Java, and *The Java Source Book* by Ed Anuff (Wiley Computer Publishing) is a good starting point for those interested in multimedia Java programming.

EFFECTIVE SOUND

An audio applet such as *JavaTime* needs sound effects. Most people are familiar with Pulse Code Modulation (PCM), the uncompressed form of digital audio data commonly stored in .WAV files. Although PCM files are useful for sound effects or in multimedia CD-ROM titles, their large size can result in painfully long downloads when used on a Web site. As a result, Java uses a form of

digital audio called μ -law (pronounced mu-law), whose data rate is more realistic for modems. These files are typically saved with an .AU extension.

Although μ -law may sound like an exotic term from a science-fiction movie, it is something you probably use everyday. To wit: μ -law is an encoding scheme designed specifically for compressing speech patterns; it typically uses a data sampling rate of 8,000

to 8,000 kHz. This conversion can adversely affect audio quality. Therefore, you should focus on speech and audio effects when you create Java audio data.

But you don't have to throw out your existing PCM audio files: A number of programs can help you convert them for use with Java. *SOUND eXchange* (SOX), for example, has a spartan interface, but it is available for OS/2, Unix, and Windows. Windows users can also use *CoolEdit* (<http://www.netzone.com/syntrillium/#Cool>) or *Goldwave* (<http://web.cs.mun.ca/~7Echris3/goldwave/goldwave.html>) for file conversion. And OS/2 users can use *PM Sound Exchange* (pmsx-221.zip at <ftp.cdrom.com> or <ftp-os2.nmsu.edu>) to convert to and from μ -law.

PLAYING YOUR FILES

Java offers two different options for playing the audio content: `applet.play()` and `AudioClip`. The `applet.play()` method can load and play a file in a single step. Since `applet.play()` is so easy to use, it may be tempting to use this method all the time. But `applet.play()` offers no control over audio playback, and it actually reloads the entire audio file each time it is used. Reloading may be barely noticeable if the data is located on your machine, but it could

be excruciatingly slow if users are transferring the file over a phone line.

The `AudioClip` class provides a better solution for audio playback, and *JavaTime* uses it to play both the clock ticks and alarms. Unlike `applet.play()`, `AudioClip` allows you to preload audio files before they are needed and to keep the audio data in memory without having to reload it each time you play. The `AudioClip` class also adds methods to stop playback and to loop an audio file indefinitely.

When you use `AudioClip.loop()`, however, you need to remember to stop audio playback via `AudioClip.stop()` if the user

kHz (or 8,000 bytes per second). Because of its low transmission requirements and the superior speech quality it produces, μ -law is used in North America in such devices as answering machines and telephones. These qualities also make μ -law appropriate for Java digital audio files.

Unfortunately, μ -law has some liabilities. Because the algorithm is optimized for speech, music may not sound as clear as it would with PCM. In addition, because μ -law uses an 8,000-kHz sampling rate, high-fidelity audio (which usually has rates of 22,050 or 44,100 kHz) must be converted or resampled



stops your Java application. If you forget to stop the looping, users will be tortured by your audio effects until they close their browsers, and they'll rue the day they stopped at your Web site.

The AudioClip class is a noticeable improvement over `applet.play()`, although some surprising omissions make it difficult to write a serious multimedia application in Java. For example, there is no way to determine when an audio clip is finished playing. Plus, if you've used the multimedia functions available in OS/2 or Windows, you'll be shocked to discover that the AudioClip class does not provide a way to find a track or to record digital audio. Furthermore, Java cannot control CD-ROMs, MIDI files, or digital video.

Besides the AudioClip class and the `applet.play()` method, Java offers a software mixer that can digitally mix (or combine) as many audio streams as your CPU can handle. Since the number of simultaneous audio streams will vary dramatically depending on the processing power available, you should always test your program on slow machines before you release your Java application. For example, if you design your audio application on a PowerPC machine, it may be able to handle eight simultaneous streams easily, while the same number of audio files may cripple a low-end 386. As a general rule, most operating systems and processors running Java can handle at least two audio streams without becoming overburdened.

THREADING THE MULTIMEDIA NEEDLE

Now let's take a look at how threads are used in JavaTime, and why they are so essential for proper multimedia programming. (You'll find an excellent overview of threads at the JavaWorld site, at <http://www.javaworld.com>). Multimedia programs often have numerous audio and video actions going on and must synchronize events to prevent users from becoming bewildered. Threads allow applications to perform the simultaneous tasks required for multimedia, and, because Java supports threads, Java has the necessary foundation for advanced audio development.

Our JavaTime applet uses threads to ensure that audio effects always happen in concert with the movements of the clock hands. The applet uses one thread to make a ticking sound every second, another thread to create alarm effects at specific intervals, and a third to update the clock display. Since each thread is responsible for executing a specific action at a certain time, the applet is much simpler to write and debug. All of these tasks could be crammed into a single thread, but then the code would be more complex. Furthermore, under certain circumstances, JavaTime must move the hands of the clock, play a tick sound,

and play a sequence of gongs simultaneously. Under these conditions, obtaining reliable synchronization with a single thread would be extremely challenging, if not impossible.

Unfortunately, Java threads will not necessarily behave identically on every operating system. That is, as long as you run your Java programs on a preemptive multitasking system (such as OS/2 or Windows NT), the operating system will ensure that each thread is

```
class CDAudio
{
    int x;
    int tracks;

    public native void open();
    public native void play();
    public native void pause();
    public native void resume();
    public native void seek(int seekto );
    public int numtracks()
    {
        return tracks;
    }
    public native void close();
    static
    {
        try{
            System.loadLibrary("MYCD");
        }
        catch (UnsatisfiedLinkError e){}
    }
}
```

FIGURE 1: Illustration of the CD-audio native method.

given a fair chance to run. However, if you run it on a nonpreemptive operating system (such as Windows 3.1, when Java becomes available for that platform), there isn't any means of ensuring that each thread will get its turn to run. As a result, if a thread is processor-intensive (that is, performs signal processing) or does not use `Thread.sleep()` to let other threads have the CPU, it may bring certain systems to their knees.

Furthermore, Java's threads can't turn a mediocre multitasking system into a reliable multimedia platform. For instance, although Windows 95 will preemptively multitask Java threads, if you place a heavy load on the system (or even simply start an editor), Java may become unreliable and you might hear breaks in the audio. By contrast, even under much heavier loads, OS/2 and Windows NT run multithreaded Java programs smoothly.

Besides synchronization, another important use for threads is the improvement of usability. If you perform all of your time-consuming multimedia processing on a user-interface thread (the thread which receives mouse events), the user will not be able to interact with your application. For this reason, if your

multimedia activity takes longer than a tenth of a second, you should have the user interface thread communicate with a worker thread to perform the multimedia function.

Although threads are essential for a well-written Java multimedia application, debugging a multithreaded, multimedia program can be difficult. The Java debugger (jdb) can set breakpoints, examine variables, and perform other rudimentary functions. Unfortunately, it is a basic command-line tool and can be tricky for novice users to learn. Luckily, vendors such as Borland, Symantec, and others offer debuggers that are graphical and considerably easier to use. If you don't want to use jdb, you can always use one of the oldest debugging techniques: writing debugging information—via `System.out.println()`—to standard output.

Multimedia problems are often timing sensitive and the use of a debugger or `System.out.println()` can affect timing enough to mask or hide the problem. For example, if you have a multimedia thread that performs synchronization every 50 milliseconds, printing to standard output can slow the thread down so much, it can no longer synchronize with another thread. Therefore, for these timing-sensitive bugs, you may want to create a Java class that logs messages and then writes the log to standard output (or a file) when the application terminates.

Java audio programs also vary in their interaction with other audio applications.

For instance, the April release of the OS/2 Java beta allows multiple Java sessions with audio. Once another Java audio session is started, however, the first one can't regain control of the audio driver until the latter program is terminated. By contrast, under Windows 95 or NT, you can have only one Java audio program active at a time. Subsequent Java audio apps throw exceptions when audio methods are invoked.

The final variance in Java multimedia applets are the bugs specific to the Java port for that operating system. Java was originally written for Solaris and then ported to environments such as Windows 95 and NT. Because the engineers porting Java to each environment are not perfect, there will be unique bugs in each operating system to which Java is ported. Most of these bugs will be minor, but you should thoroughly test your Java applet on every operating system you intend to support. For example, although JavaTime runs flawlessly in 32-bit Windows environments (Win32), there are some minor audio glitches in the April release of the OS/2 Java beta.

GOING NATIVE IN JAVA

The architects of Java created a special kind of Java method, called the native method, to

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address the impossibility of Java instantly having the same number of software libraries as C or C++. Native methods allow you to link code written in C, C++, Smalltalk, or any compiled language directly into your Java programs. Native methods allow you to improve Java's capabilities, although they do have a noticeable drawback: once you link in a native method, your Java program becomes tied to a specific operating system.

If you want to retain portability, you must provide native methods for every platform you intend to support. In addition, your users will have to download the native method DLLs (or, for Unix machines, the shared libraries) into a directory indicated by the CLASSPATH variable before your applet will work. Sun has intentionally required careful setup for native methods, because one of Java's primary directives is never to violate security or execute untrusted code. Since the native method is considered an untrusted binary piece of code, Java will not execute it directly off of the Web. Rather, the user must knowingly download the binary and correctly configure the environment before the code will work.

JavaTime takes advantage of native methods to address one of the gaping holes in the Java multimedia API—the lack of CD-audio support (Figure 1). When you position the cursor on the clock face and click the left mouse button, JavaTime loads a CD-audio class with native methods to open, play, pause, resume, seek, and close the CD. If you are running OS/2, Windows 95, or Windows NT (on Intel), you'll have to download the native method for your operating system and update your CLASSPATH variable before the CD-audio class will work.

If you examine the code for the CD-audio native methods, you'll notice that there is almost no difference between the OS/2 and Win32 versions of the code. This is because the multimedia Media Control Interface (MCI) used in both environments was designed jointly by IBM and Microsoft and remains similar years after these companies ceased joint development.

Although the MCI interface is similar, you must carefully monitor the thread you use to call a native method. For operating systems designed to handle multimedia calls from multiple threads (such as OS/2), it is irrelevant which thread uses a native method. By contrast, the Win32 API has a cumbersome restriction that requires the same thread to issue all multimedia APIs. (Surprisingly, this restriction applies to Windows NT, too, even though it isn't burdened with the DOS heritage that Windows 95 is). Since Java programs have multiple threads, you may have to tweak these apps to ensure that the correct thread calls the native multimedia method. For example, JavaTime originally used a special thread to create the CD object to improve per-

formance. Unfortunately, while this worked with OS/2, it failed on Windows 95 and NT. Thus, I was forced to modify JavaTime to make all CD-audio calls on the thread that handles mouse-related functions, such as mouseenter() and mouseexit(), so that JavaTime would work in both environments.

For a look at how JavaTime is able to utilize native methods, threads, and the Java audio classes, go to PC Magazine's Web site, at <http://www.pcmag.com>. You can also download javatime.zip from PC Magazine Online. (See the sidebar "Guide to Our Utilities" in this issue's Utilities column for downloading instructions.) This package contains all of the JavaTime source code, binaries, audio content, and C source code for the CD-audio native methods. If you would like to recompile JavaTime, you'll need the Java Developer's Kit (JDK) from JavaSoft. Windows 95 or NT users will need Visual C++, Version 4.0 or later, to recompile the native method. OS/2 users should use C-Set++, Version 2.0 or later, to recompile the native method. Additional compilation instructions can be found in the javatime.zip file.

Because there are noticeable holes in the Java multimedia support, people are scrambling to add native methods to patch these weaknesses. One of these efforts is the proposal for a standard MIDI object (<http://www.users.interport.net/~mash/javamidi.html>). The author of this site has uploaded both the Java source code and the C code for the native method and encourages programmers to port it to as many operating systems as possible.

Even though native methods are useful, they are not part of Java and therefore cannot compensate completely for the limitations inherent in the language. Fortunately, JavaSoft is aware of these restrictions and has announced agreements with Adobe, Macromedia, and Silicon Graphics to enhance the multimedia portions of the API. JavaSoft is also working on a set of media APIs that will offer additional control over audio functions.

As we've discovered, Java lets you create exciting multimedia applications that run on a variety of operating systems using a single binary. Unfortunately, Java also has noticeable gaps in multimedia functionality that limit its usefulness as a true cross-platform multimedia solution. Since JavaSoft and a number of vendors are working feverishly to address these limitations, Java may indeed become the multimedia platform of choice. In fact, once these issues are addressed, we may discover that though Java may not turn out to have the answer to the lost island of Atlantis, it could lead us to the Holy Grail of portability. □

Linden deCarmo is a software engineer for Motorola in Plantation, Florida. You can contact him at lindend@ibm.net.

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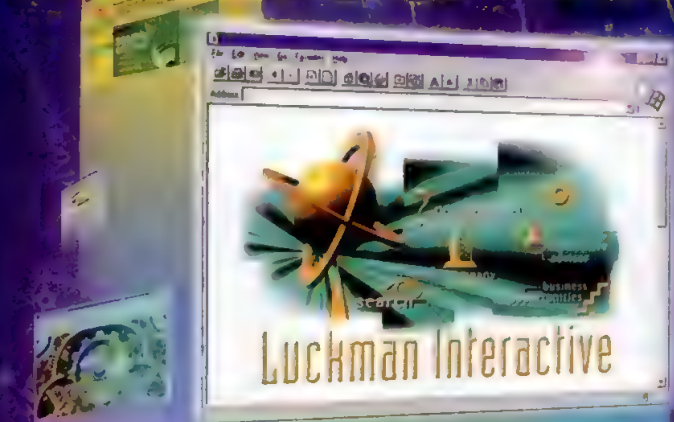
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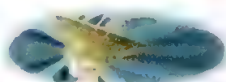


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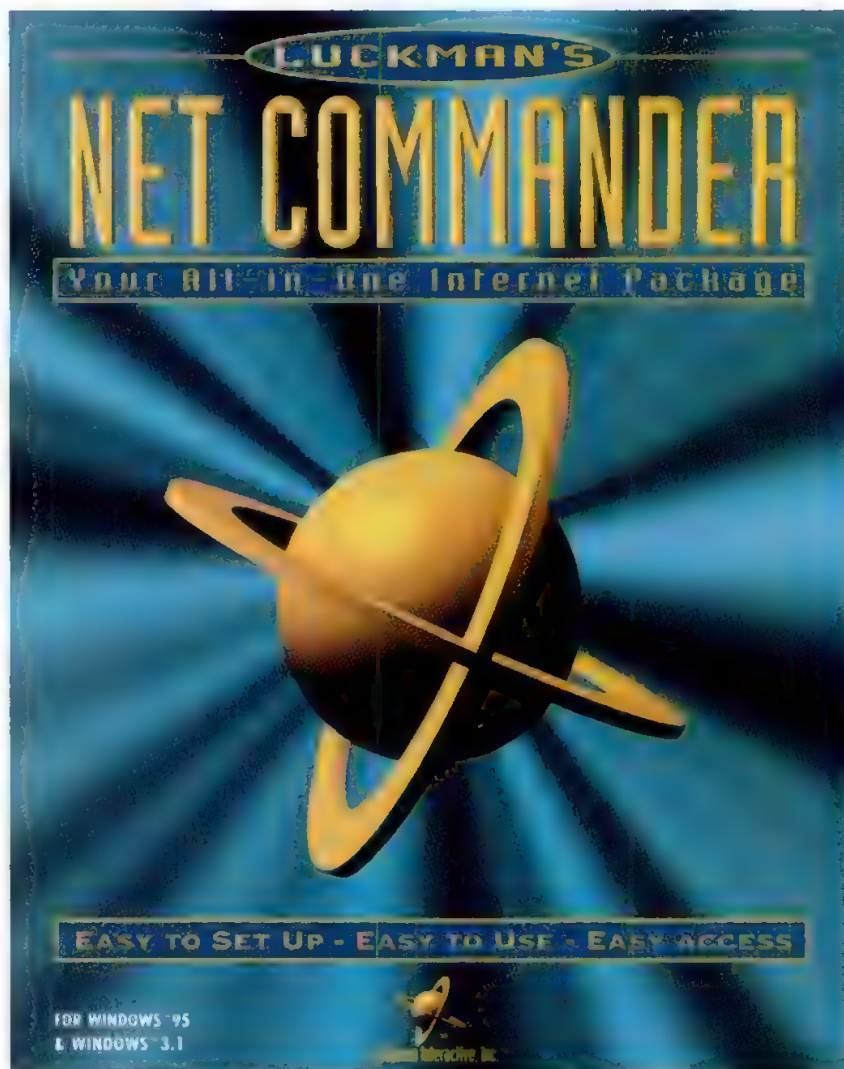
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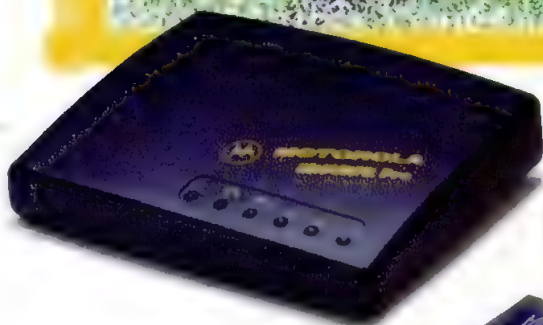
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PC Tech/Utilities

By Jeff Prorise

A Most-Recent Programs Option

RUPL adds a recently used programs list to your Start menu.

One of Windows 95's handiest features is the Start menu's recently used documents list. This gives you faster access to any type of file that's associated with a program, not just word processing documents. To reopen a document you've recently edited, display the Start menu, click on Documents, and select the document you wish to edit. Beta versions of Windows 95 featured a recently used programs list that made it equally easy to rerun recently used programs. But this list was removed before the product shipped, presumably because Microsoft felt that it took away from the shell's document-centric personality.

This issue's utility, RUPL, adds a recently used programs list to Windows 95, so you can easily restart the applications you use most frequently. RUPL is a 32-bit Windows utility that runs only under Windows 95. It won't run in 16-bit Windows (Windows 3.x and Windows for Workgroups 3.1x), and it's not compatible with Windows NT, because it uses some special features of Windows 95 that Windows NT lacks.

You can obtain a copy of RUPL by downloading it from PC Magazine Online or by mail (see the sidebar "Guide to Our Utilities" for details). If you'd like to see the source code, you can download that, too. RUPL was written in C and compiled with Microsoft Visual C++ 4.0. The make files provided with the source code are for Visual C++. You can compile the source code with other compilers if you create new make files.

INSTALLING RUPL

To install RUPL, copy its two program files, `Rupl.exe` and `Ruplib.dll`, to a directory on your hard disk. Then create a shortcut for `Rupl.exe` in the Windows 95 Startup folder so the program will be loaded automatically each time the system is started. Once these steps are complete, you can launch RUPL by double-clicking on it, or you can restart Windows 95, and RUPL will be loaded from the Startup folder.

To verify that RUPL is properly installed, start a few applications and then pull up the Start menu and click on Programs. You should see a Recently Used item in the Programs menu. Clicking on Recently Used

should display a submenu that contains entries for the applications you just started, as shown in Figure 1. RUPL remembers the 15 programs you've run most recently. When the list is full and another program is started, RUPL automatically deletes the oldest entry from the list.

To uninstall RUPL, delete its shortcut from the Startup folder and reboot your computer. After the computer has restarted, you can delete the RUPL program files. To complete the deinstallation, delete the Recently Used folder from the Start menu.

USING RUPL

Once RUPL is installed, it manages the recently used programs list entirely on its own.

IN THIS ISSUE

RUPL...

RUPL (recently used programs list) mimics the Windows 95 Taskbar's Documents choice—but instead of remembering documents, it remembers programs you've run recently, giving you a handy way to launch them.



To start a recently used program, click on Start | Programs | Recently Used and select a program name.

While it's running, RUPL sits quietly in the background and monitors the system for program launches. RUPL applies some simple logic to weed out programs that you aren't likely to want to start from a menu. It doesn't add DOS programs to the menu, and it doesn't add Windows programs that are executed as children of other programs. It also refrains from adding background programs that run without windows of their own.

RUPL isn't perfect. It will occasionally add an item to the Recently Used menu that won't successfully start a program. There are a few applications that it won't add to the menu at all. And if it can't generate a descriptive name

for a program it adds to the menu (for example, "Microsoft Word" for `Winword.exe`), RUPL will add the .EXE name. If any of these shortcomings proves to be a problem, you can customize RUPL's behavior by adding entries to the Windows 95 registry.

Registry entries govern three key aspects of the program's behavior: the maximum number of program names displayed in the Recently Used menu, the descriptive program names displayed in the Recently Used menu, and the programs that are excluded from the Recently Used menu. The safest and easiest way to modify registry entries is via a .REG file (a text file with the file type .REG).

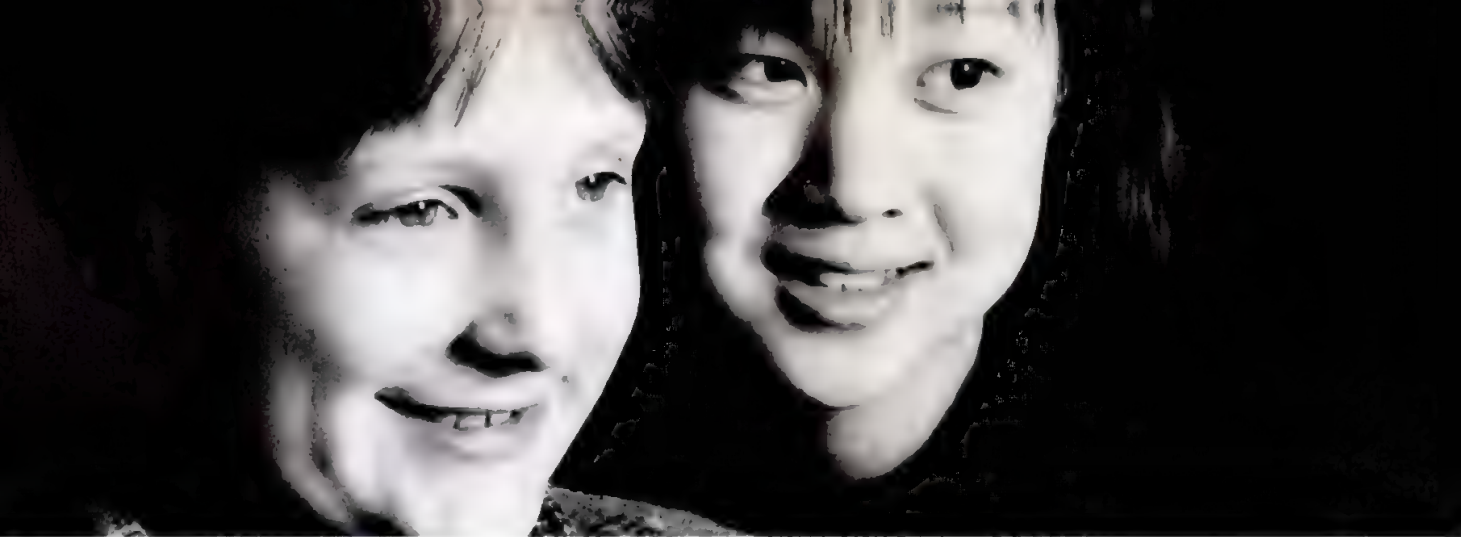
Most Windows 95 .REG files start with the line `REGEDIT4`, which identifies the file format to the Registry Editor—the application that converts statements in .REG files into entries in the registry. Below this is the registry key where you want to make the change, delimited by square brackets. And below this are the named values and their data. To merge the contents of a .REG file into the registry, right-click on its icon and select Merge from the context menu. The shell will pass the .REG file's filename to the Registry Editor and the Registry Editor will perform the merge.

The following .REG file reduces the maximum number of items in the Recently Used menu from 15 to 10:

```
REGEDIT4
[HKEY_LOCAL_MACHINE\Software\PC
Magazine\RUPL\V1.0]
"MaxMRU"=dword:0000000A
```

The value 0000000A is the hexadecimal (base 16) representation for the decimal value 10.

Before it adds an item to the Recently Used menu, RUPL attempts to generate a descriptive name for the application. If it is unable to do this, RUPL adds the program's .EXE filename to the menu. You can override the names RUPL adds to the menu with names of your own. The following .REG file changes Microsoft Word's descriptive program name to "Word for Windows." It also assigns descriptive text to `Capture.exe` so that it shows up in the Recently Used menu as "Screen Capture Utility."



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REGEDIT4

```
[HKEY_LOCAL_MACHINE\Software\PC
➤Magazine\RUPL\V1.0\Descriptive Names]
"Winword.exe"="Word for Windows"
"Capture.exe"="Screen Capture Utility"
```

If you see an entry in the Recently Used menu and have no idea where it came from, it probably refers to a helper application that was started by another application. You can exclude helper applications that RUPL adds to the menu by mistake. To find out the .EXE name that corresponds to any item in the Recently Used menu, open the Recently Used folder, right-click on the .LNK file that has the same name as the menu item, select Properties from the context menu, and click on the Shortcut tab. You'll see the .EXE name in the box labeled Target.

For example, when a Dial-Up Networking connection is made, a do-nothing item with the name Rnaapp.exe is placed in the recently used program list. To exclude it, create a .REG file with these lines:

REGEDIT4

```
[HKEY_LOCAL_MACHINE\Software\PC
➤Magazine\RUPL\V1.0\Excluded Programs]
"Rnaapp.exe"=dword:00000000
```

You can make a series of configuration changes from a single .REG file by including entries for all the registry modifications you wish to make. The following .REG file makes

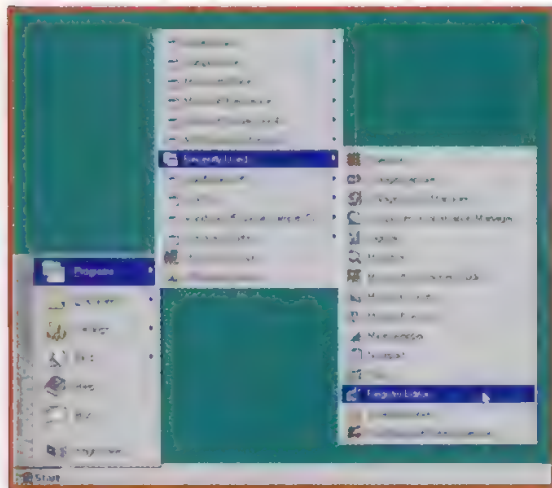


FIGURE 1: RUPL adds a Recently Used menu that contains entries for the 15 programs you've used most recently to the Start menu's Programs menu.

all the configuration changes described above in one step:

REGEDIT4

```
[HKEY_LOCAL_MACHINE\Software\PC
➤Magazine\RUPL\V1.0]
"MaxMRU"=dword:0000000A

[HKEY_LOCAL_MACHINE\Software\PC
➤Magazine\RUPL\V1.0\Descriptive Names]
```

```
__declspec (dllexport) LRESULT CALLBACK ShellProc (int nCode, WPARAM wParam,
LPARAM lParam)
{
    char szDir[MAX_PATH];

    if ((nCode == HSHELL_WINDOWCREATED) && (g_hWnd != NULL)) {
        GetCurrentDirectory (sizeof (szDir), szDir);
        PostMessage (g_hWnd, WM_USER, (WPARAM) GlobalAddAtom (szDir),
            (LPARAM) wParam);
    }

    return CallNextHookEx (g_hHook, nCode, wParam, lParam);
}
```

FIGURE 2: Rupllib.dll's ShellProc function processes hook notifications.

```
"Winword.exe"="Word for Windows"
"Capture.exe"="Screen Capture Utility"
```

```
[HKEY_LOCAL_MACHINE\Software\PC
➤Magazine\RUPL\V1.0\Excluded Programs]
"Rnaapp.exe"=dword:00000000
```

If you'd like to see the changes this .REG file makes to the registry, invoke RegEdit and click your way to RUPL's main key:

```
\HKEY_LOCAL_MACHINE\Software\PC
➤Magazine\RUPL\V1.0
```

UNDER THE HOOD

RUPL isn't a large program—together, Rupl.c and Rupllib.c, the source code files for Rupl.exe and Rupllib.dll, contain fewer than 1,000 lines of code. But for a utility its size, RUPL does a lot. Its source code demonstrates how to identify the Start menu folder and its subfolders programmatically, how to notify the shell of changes made to those folders, how to create .LNK files containing shortcuts to other files, how to use Windows 95 ToolHelp functions to gather information about 16- and 32-bit processes, and how to install global hooks that make use of callback procedures in Win32 DLLs.

The first challenge in creating a utility like RUPL is to establish a mechanism for detecting program launches. RUPL does it by setting up a global "shell hook" that gets called in response to a variety of events. The event we're interested in is the creation, anywhere in the system, of a top-level window—a pretty good indication that a new application has been started. The code to establish the hook resides in Rupl.c:

```
hInstDll = (HINSTANCE) GetModuleHandle
("rupllib.dll");
hHook = SetWindowsHookEx (WH_SHELL,
(HOOKPROC) ShellProc,
hInstDll, 0);
```

Global shell-hook procedures—the callback functions that the system calls to report hook events—must reside in DLLs. In this case, the hook procedure is a function named ShellProc, and it's located in Rupllib.dll. RUPL calls GetModuleHandle to get the DLL's instance handle (the DLL is already in memory, because it is loaded automatically when Rupl.exe is started), and then passes the instance handle along with the address of ShellProc to the Win32 SetWindowsHookEx function. This creates the hook and returns a hook handle of type HHOOK.

After setting the hook, Rupl.exe passes the hook handle and the handle of RUPL's own window to the DLL:

```
if (!SetHookHandle (hHook) ||
➤!SetWindowHandle (hwnd)) {
    // Error!
}
```

SetHookHandle and SetWindowHandle are local functions exported by Rupllib.dll. The DLL needs the hook handle so it can call CallNextHookEx, in order to pass hook notifications down the line to other applications that have installed shell hooks. In Windows 95, calling CallNextHookEx is not just a formality, because the system also uses a shell hook to detect the creation and destruction of top-level windows. If you don't pass hook notifications along to the system, applications will stop appearing in the Taskbar. The DLL needs RUPL's window handle so it can send messages to the window with PostMessage calls (for the reason, see below). If the hook handle and window handle have been set before, SetHookHandle and SetWindowHandle return FALSE and RUPL quits with an error message. This simple precaution prevents multiple instances of RUPL from being executed.

SetHookHandle and SetWindowHandle store the hook handle and window handle in global variables named g_hHook and g_hWnd. By default, global variables declared in a Win32 DLL are instantiated into each and every copy of the DLL that is mapped into the address space of a running process. ShellProc



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is always called in the context of the current process, so if `g_hHook` and `g_hWnd` aren't placed in a shared data segment, the values copied to them by `SetHookHandle` and `SetWindowHandle` won't be visible to processes other than RUPL itself. So that `g_hHook` and `g_hWnd` will be truly global variables that are visible to *all* processes, they're declared between a pair of pragmas that place them in a data segment named "Shared:"

```
#pragma data_seg ("Shared")
HHOOK g_hHook = NULL;
HWND g_hWnd = NULL;
#pragma data_seg ()
```

Linking Ruplib.dll with the switch

```
/SECTION:Shared,RWS
```

then makes "Shared" a shared data segment.

Once the hook is set and the hook handle and window handle are stored in shared memory inside the DLL, `Ruplib.dll`'s `ShellProc` function, shown in Figure 2, gets called with hook notifications. When `ShellProc` is called because a top-level window was created, `nCode` equals `HSHELL_WINDOWCREATED` and `wParam` holds the window's handle. `ShellProc` responds by querying the system for the current directory and passing both the directory name and the window handle to RUPL's main window with a call to `PostMessage`.

The window handle is passed in the message's `lParam`. The string specifying the current directory can't be passed directly because Windows 95 runs 32-bit processes in private address spaces, which means a string address that is valid in the context of one application is not valid in the context of another. `ShellProc` gets called in the context of the application that's starting up (not in the context of RUPL, which

is a separate process), so a string address generated by `ShellProc` is meaningless to the routines in `Rupl.exe`. Therefore, `ShellProc` uses `GlobalAddAtom` to add the directory name to the global atom table (a dictionary-like list of strings maintained by the operating system), casts the ATOM returned by `GlobalAddAtom` to a `WPARAM`, and passes the `WPARAM` in the message's `wParam`. On the receiving end, RUPL's window procedure reads the string by casting `wParam` to an ATOM and passing the ATOM to `GlobalGetAtomName`. This is a handy technique for passing strings across process boundaries in the Win32 environment without resorting to more complex forms of interprocess communication.

MENU MECHANICS

Whenever a top-level window is created, the hook procedure in the DLL sends RUPL's window procedure a `WM_USER` message, with

```
void UpdateMRUList (HWND hwnd, HWND hwndTarget, LPSTR
pszDir)
{
    HWND hwndOwner;
    char szExeName[MAX_PATH];
    char szTitle[MAX_PATH];
    char szProgramsFolder[MAX_PATH];
    char szRecentlyUsedFolder[MAX_PATH];
    char szLnkName[MAX_PATH];
    UINT nMRUMax;

    // Make sure hwndTarget refers to an unowned window.
    while ((hwndOwner = GetWindow (hwndTarget, GW_OWNER))
    != NULL)
        hwndTarget = hwndOwner;

    // Convert the window handle into a path name.
    if (!HwndToPath (hwndTarget, szExeName, sizeof
(szExeName)))
        return;

    // Quit now if szExeName holds the EXE name of an app
    // we don't support.
    if (!IsExeOK (szExeName))
        return;

    // Don't do anything if the window has a sibling that
    // belongs to the same process and a shortcut has
    // already been created from the sibling. This
    // eliminates redundant menu entries for apps that
    // create multiple unowned top-level windows.
    if (IsDuplicate (hwndTarget, szExeName))
        return;

    // Generate a descriptive name for the application.
    if (!GetTitleFromRegistry (szExeName, szTitle, sizeof
(szTitle))) {
        if (HwndToTitle (hwndTarget, szExeName, szTitle,
sizeof (szTitle)))
            DeleteNonDescriptiveName (hwnd, szExeName);
    }

    else {
        ExeToTitle (szExeName, szTitle, sizeof
(szTitle));
        if (RefreshExistingLnkFile (hwnd, szExeName))
            return;
    }

    // Get path names for the Programs folder and the
    // Recently Used folder.
    if (!GetProgramsFolder (hwnd, szProgramsFolder) ||
    !GetRecentlyUsedFolder (hwnd,
szRecentlyUsedFolder))
        return;

    // Create the Recently Used folder if it doesn't
    // already exist and build a path name for the
    // shortcut that will be created in the folder.
    CreateDirectory (szRecentlyUsedFolder, NULL);

    lstrcpy (szLnkName, szRecentlyUsedFolder);
    lstrcat (szLnkName, "\\");
    lstrcat (szLnkName, szTitle);
    lstrcat (szLnkName, ".lnk");

    // Create a shortcut in the Recently Used folder. If
    // the number of shortcuts exceeds the maximum number
    // of entries allowed in the menu, delete one or more
    // shortcuts.
    if (SUCCEEDED (CreateLink (szExeName, pszDir,
szLnkName))) {
        nMRUMax = GetMRUMax ();
        while (GetLnkFileCount (szRecentlyUsedFolder) >
nMRUMax)
            DeleteOldestLnkFile
            (szRecentlyUsedFolder);
        SHChangeNotify (SHCNE_UPDATEDIR,
SHCNF_PATH, szProgramsFolder, 0);
    }
}
```

FIGURE 3: RUPL's `UpdateMRUList` function converts a window handle and a directory name into an item in the Recently Used menu.

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```
HRESULT CreateLink (LPSTR pszFileName, LPSTR pszWorkingDir, LPSTR pszLinkName)
{
    HRESULT hResult;
    WORD szWide[MAX_PATH];
    IPersistFile *ppf;
    IShellLink *psl;

    hResult = CoCreateInstance (&CLSID_ShellLink, NULL,
        CLSCTX_INPROC_SERVER, &IID_IShellLink, &psl);

    if (SUCCEEDED (hResult)) {
        psl->lpVtbl->SetPath (psl, pszFileName);
        psl->lpVtbl->SetWorkingDirectory (psl, pszWorkingDir);

        hResult = psl->lpVtbl->QueryInterface (psl, &IID_IPersistFile, &ppf);
        if (SUCCEEDED (hResult)) {
            MultiByteToWideChar (CP_ACP, 0, pszLinkName, -1, szWide,
                MAX_PATH);
            hResult = ppf->lpVtbl->Save (ppf, szWide, TRUE);
            ppf->lpVtbl->Release (ppf);
        }
        psl->lpVtbl->Release (psl);
    }
    return hResult;
}
```



FIGURE 4: *CreateLink creates a shortcut to an .EXE file on the hard disk.*

wParam identifying the directory in which the application that owns the window was started and lParam holding the handle of the newly created window. It's the window procedure's job to convert this information into an item in the Recently Used menu.

It's not difficult to create the Recently Used menu or to add items to it. The Start menu's Programs menu is actually a file-system folder (directory) on your hard disk. Creating a folder named Recently Used in the Programs folder adds a Recently Used menu to the Programs menu. The items in the menu are just .LNK files containing shortcuts to .EXE files. Folders can be created with the Win32 CreateDirectory API function, and the system provides OLE functions for creating .LNK files. The greater challenge in creating a utility like RUPL is to gather the information that goes into the .LNK files. In RUPL, most of the work is done by the UpdateMRUList function, shown in Figure 3.

The comments in the source code provide a play-by-play account of what UpdateMRUList does to convert the information provided to it into an item in the Recently Used menu. To create a shortcut for the application that was just started, UpdateMRUList needs three key pieces of information: a pathname for the application's .EXE file, a descriptive name for the application, and a pathname for the application's "home" directory.

The last of these items is provided to UpdateMRUList through the pszDir parameter in its argument list. The text string referenced by pszDir is nothing more than the

pathname returned by the hook procedure's call to GetCurrentDirectory. This information is embedded in the shortcut for the benefit of programs that run properly only if they're started from certain locations. The first two items—the path to the application's .EXE file and a descriptive name—must be generated from the window handle passed in hwndTarget. Much of the code in Rupl.c is devoted to doing just that.

UpdateMRUList's first order of business is to make sure hwndTarget refers to an unowned top-level window. "Unowned" means the window isn't owned by another window—that is, that calling GetWindow with a window handle and a GW_OWNER parameter returns NULL. The following while loop ensures that hwndTarget references an unowned top-level window:

```
while ((hwndOwner = GetWindow
(hwndTarget, GW_OWNER)) != NULL)
    hwndTarget = hwndOwner;
```

This simple precaution allows RUPL to act properly on the relatively few occasions when its hook procedure is called for an owned top-level window. The Win32 documentation says that HShell_WINDOWCREATED notifications are sent only for owned top-level windows, but there are circumstances in which the documentation is wrong. For example, many Delphi applications keep their unowned top-level windows hidden and expose themselves to the world through owned top-level windows. When this happens, the system

calls RUPL's hook procedure for the owned top-level windows but not for the unowned top-level windows. Tracing the window handle "up the ladder" to an unowned window reduces the chance that RUPL will mistakenly create two or more menu items referring to the same application.

UpdateMRUList's next act is to convert the window handle into an .EXE pathname. To do so, it calls a local function named HwndToPath. HwndToPath uses the CreateToolhelp32Snapshot function, which is part of the Win32 ToolHelp API, to create a "snapshot" of all the processes currently running in the system. It then walks the process list until it finds a process whose process ID equals the process ID returned by GetWindowThreadProcessID. The .EXE name is copied out of the PROCESSENTRY32 structure's szExeFile field and into the buffer whose address is provided by the caller. As a practical measure, HwndToPath weeds out executable filenames that don't end with .EXE. It also rules out processes that are children of other processes (processes for which th32ParentProcessID is nonzero).

Why does RUPL use ToolHelp functions to convert a window handle into an .EXE name instead of getting the window's instance handle and calling GetModuleFileName? Remember that Windows 95 isolates processes from one another by running them in separate address spaces. When HwndToPath is called, RUPL is the current process. In the Win32 environment, GetModuleFileName doesn't work if it's called to retrieve the filename of a module that belongs to a different process. But because the process list is a global resource, it's okay for process A to retrieve information about process B by walking the list and examining the data stored in PROCESSENTRY32 structures. 16-bit processes appear in the process list, too, so HwndToPath works equally well with 16- and 32-bit processes. The use of ToolHelp functions is the primary reason RUPL is a Windows 95-only utility. ToolHelp functions are not supported in Windows NT—at least not yet.

If HwndToPath is successful, UpdateMRUList calls IsExeOK to determine whether the .EXE filename is one that should be ignored. IsExeOK returns FALSE if the .EXE name matches any one of a list of "automatic" .EXE names RUPL maintains internally, or if it matches an .EXE name in the \HKEY_LOCAL_MACHINE\Software\PC Magazine\RUPL\V1.0\Excluded Programs branch of the registry. The automatic .EXE names include Explorer.exe and Quik-view.exe, among others. If these programs weren't excluded, they would be added to the Recently Used menu every time you double-clicked on My Computer or selected Quick View from a context menu. If IsExeOK returns FALSE, RUPL stops without adding anything to the Recently Used menu.

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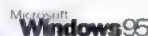
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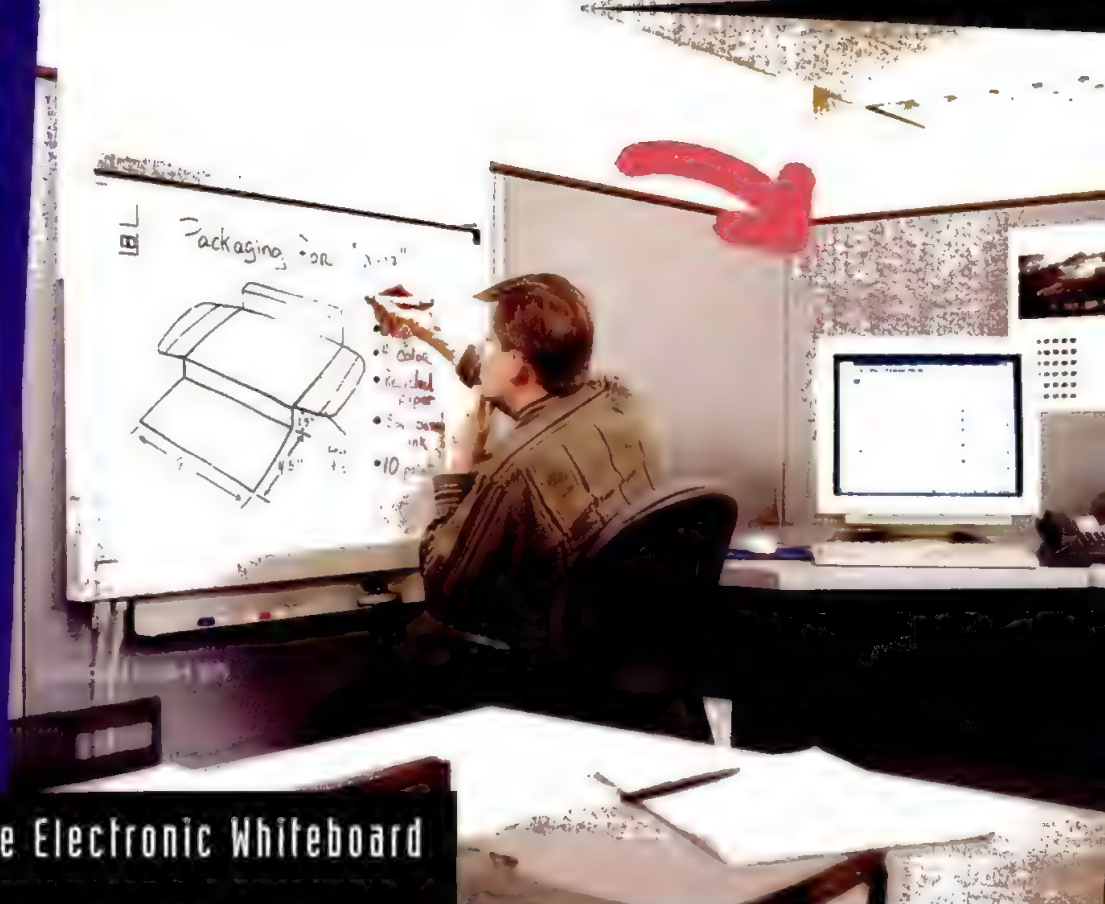
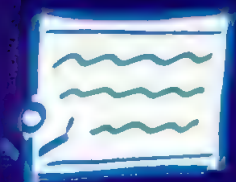


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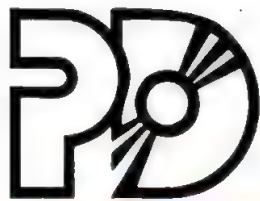


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Next on the agenda is a cross-check to make sure RUPL hasn't already created a shortcut for this application from another window that belongs to the same process. This prevents RUPL from occasionally creating multiple menu items for applications that create multiple unowned top-level windows (such applications are rare, but they do exist). The dirty work is done by IsDuplicate, which enumerates all the unowned top-level windows in the system and determines whether any window other than hwndTarget belongs to the same process as hwndTarget and also resolves to a .LNK filename that already exists in the Recently Used folder.

Once the .EXE name is known, the next piece of information RUPL needs is the descriptive name for the application. Ultimately, the descriptive name becomes the filename for the .LNK file that represents the application in the Recently Used menu. RUPL first calls HwndToTitle in an attempt to generate a descriptive program name from the application's window title. The window title is retrieved with the GetWindowText API function, which, to our good fortune, works fine across process boundaries.

HwndToTitle fails if the window title contains invalid filename characters or an embedded " - " string. The embedded hyphen string usually separates a program name and a document name, and it's not possible to determine whether the program name comes before or after the hyphen, so RUPL skips such titles.

If HwndToTitle returns TRUE, indicating a descriptive name was generated, UpdateMRUList calls another local function named DeleteNonDescriptiveName to delete a "nondescriptive" menu item (for example, "Airmos.exe") referencing the same application, if such an item exists. If HwndToTitle fails, UpdateMRUList calls ExeToTitle to generate a program name from the application's .EXE filename. If a descriptive name for the same application already appears in the menu, RefreshExistingLnkFile updates the existing menu item rather than adding an .EXE name to the menu. Updating the menu item is a simple matter of stamping the corresponding .LNK file with the current date and time. Why this is important will become apparent in a moment.

The preceding logic ensures that RUPL will never replace a descriptive program name in the Recently Used menu with an .EXE name. It will, however, replace an .EXE name with a descriptive program name whenever possible. That's important, because for some applications (Windows 95's Notepad applet is one example), RUPL's ability to create a descriptive program name from the window title depends on how the application is started.

So many applications put document names in window titles that you'd think HwndToTitle would fail the majority of the time. In practice, however, it doesn't fail very often, because most programs that include document names in their window titles don't add the document names until *after* their main windows are created. HwndToTitle is also smart enough to strip the document name

from the window title if the document name is "Untitled." Still, a good heuristic for stripping document names from window titles would make RUPL an even better program than it already is. To date, I haven't found that heuristic because it is very difficult for one program to look at another's window title and tell whether the document name (if present) appears on the left or right of the hyphen.

If everything has gone well up to now, UpdateMRUList now has an .EXE name and a descriptive program name it can work with. The next step is to create the Recently Used folder if it doesn't already exist. The path to the Programs folder can vary on different PCs (or from session to session on the same PC, if the User Profiles feature is enabled), so a hard-coded pathname won't suffice. RUPL's GetProgramsFolder function retrieves the path to the Programs folder programmatically by calling the API function SHGetSpecialFolderLocation with a CSIDL_PROGRAMS parameter and then calling SHGetPathFromIDList on the returned item ID list. Internally, SHGetSpecialFolder consults the registry to find out where the Programs folder is located. RUPL's GetRecentlyUsedFolder function creates a path to the Recently Used folder by appending "Recently Used" to the pathname returned by GetProgramsFolder. The following statement then creates the Recently Used folder:

```
CreatedDirectory (szRecentlyUsedFolder,  
NULL);
```

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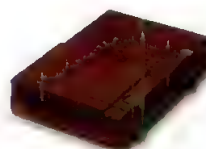
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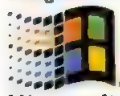


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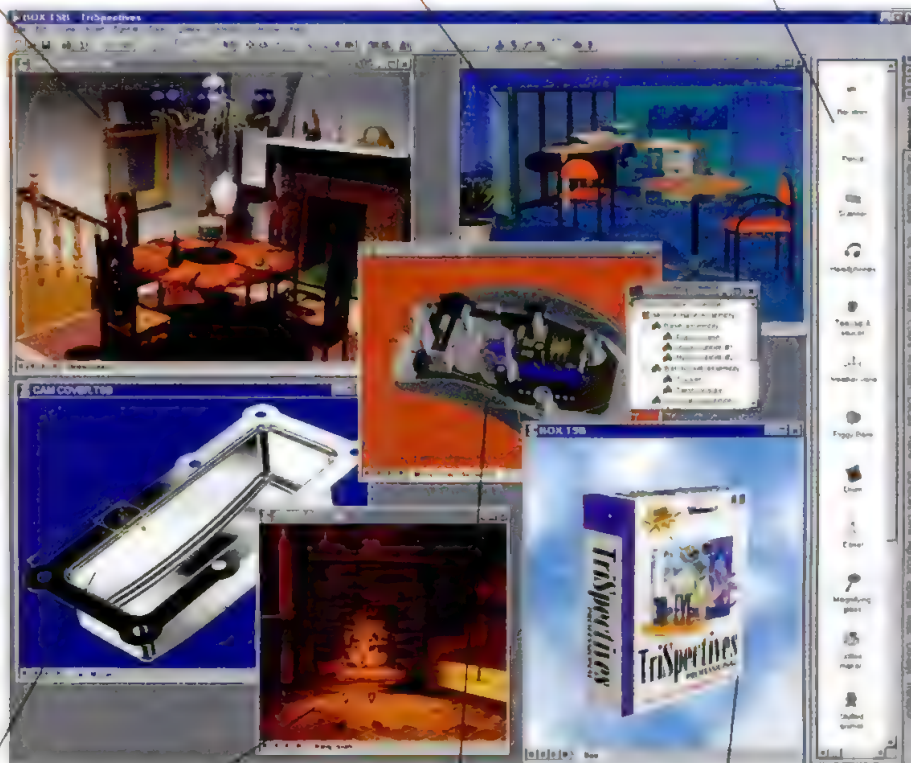


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UpdateMRUList's work is now almost done. Its next task is to add a .LNK file to the Recently Used folder representing the program whose .EXE name is stored in szExeName. The name of the .LNK file is generated by adding ".lnk" to the descriptive program name. The .LNK file is created by calling a RUPL function named CreateLink, which uses OLE's CoCreateInstance function to create an IShellLink object (the OLE representation of what we know as shortcuts) and other OLE functions to specify the shortcut's properties and save the shortcut to disk. The source code for CreateLink is shown in Figure 4. The path to the .EXE file and the .EXE's startup directory (the directory name returned when the hook procedure called GetCurrentDirectory) are recorded in the shortcut using the IShellLink functions SetPath and SetWorkingDirectory. A call to the OLE IPersistFile::Save function writes the shortcut to disk. Once the shortcut is created, it manifests itself as an entry in the Recently Used menu. The text of the menu item is the name of the .LNK file minus the filename extension.

A by-product of this file-oriented strategy is that when a program is run again, its .LNK file is created anew and stamped with the current date and time. As a result, the applica-

tion's priority in the recently used list is elevated because the corresponding .LNK file becomes the newest file in the folder.

If the call to CreateLink is successful, UpdateMRUList checks to see if the number of .LNK files exceeds the maximum number of entries permitted in the Recently Used menu. The maximum file count is obtained from the registry by RUPL's GetMRUMax function. If the file count returned by GetFileCount exceeds the value returned GetMRUMax, DeleteOldestFile is called as many times as necessary to reduce the number of .LNK files to the specified maximum. DeleteOldestFile uses file dates and times to identify the oldest file in the folder and the Win32 DeleteFile function to do its deleting. As noted above, the oldest file will be the one that has been run the least recently.

UpdateMRUList's final act before returning is to call Windows 95's SHChangeNotify function to notify the system that the contents of the Programs folder or one of its subfolders has changed. This tells the system to check the folder and incorporate any changes it finds into the Start menu.

If you decide to modify RUPL's source code and rebuild the application, there's one implementational detail you should be aware of.

So that it can call the SetHookHandle and SetWindowHandle functions exported by Ruplib.dll, Rupl.c must be linked with the import library Ruplib.lib. Ruplib.lib is created for you automatically when Ruplib.c is compiled and linked. Consequently, to compile and link Rupl.c, you must first compile and link Ruplib.c. To make Ruplib.lib visible to the compiler, copy it either to the directory where Rupl.c is stored or to the directory where the compiler stores its .LIB files. Failure to do so will result in "unresolved reference" errors at link time. Rupl.c must also be linked with the import libraries Th32.lib and Version.lib, which are provided as part of the SDK but are not included in most applications.

If you have questions about RUPL, drop a note to me in the Utilities section of ZD Net's Tips forum on CompuServe (GO ZNT:TIPS). My user ID is 72241.44. From the Internet, send e-mail to 72241.44@compuserve.com. I'd much prefer to field questions in the forum so others can benefit from our discussions too, but if you don't have access to CompuServe, I'll gladly respond to e-mail queries. □

Jeff Proise is a contributing editor of PC Magazine.

GUIDE TO OUR UTILITIES

About RUPL...

DESCRIPTION RUPL adds a recently used programs list to your Windows 95 Start menu. By default, the first 15 items are saved. Select an item in the list to relaunch it.

USAGE To install RUPL, copy the program files Rupl.exe and Ruplib.dll to a directory on your hard disk. Then create a shortcut for Rupl.exe in Windows 95's Startup folder so the program will be loaded automatically each time the system is started. To run RUPL for the first time, double-click on the RUPL shortcut in the Startup folder or reboot your system.

To uninstall RUPL, delete the shortcut to RUPL in the Startup folder and reboot your computer. After the computer has restarted, you can delete the RUPL program files. To complete the deinstallation, delete the Recently Used folder from the Start menu.

You can see the .EXE name of a program in the recently used programs list by right-clicking on its icon and selecting Properties.

You can customize RUPL's behavior by adding entries to the Windows 95 registry. See the main article for details on doing this.

SUPPORT Help for PC Magazine's free utilities can be obtained electronically in the Utilities section of ZD Net's TIPS forum (GO ZNT:TIPS). The authors of current utilities generally visit this forum daily. You may find an answer to your question simply by reading the messages posted in the forum. If the author is not available and the forum sysops can't answer your question, the Utilities column editor, who also checks this forum each day, will contact the author for you.

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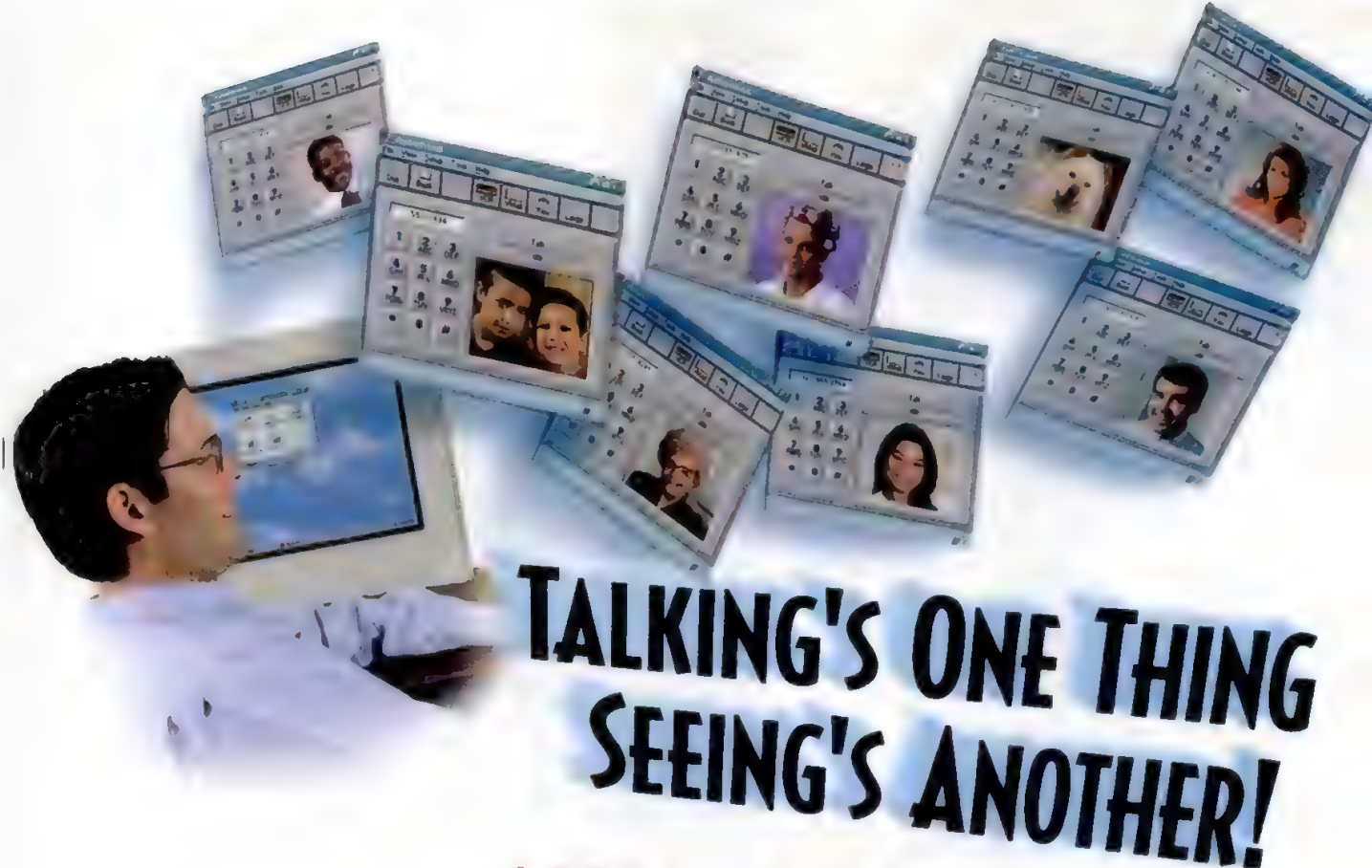
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PC Tech/Lab Notes

By Mark L. Van Name and Bill Catchings

Benchmark-Testing Notebook Battery Life

Now you can objectively test laptops, using BatteryMark and ZDigit II.

If you've ever considered buying a notebook computer, you've certainly wondered how long its battery would allow you to keep working. In this issue's review of Pentium notebooks, we premiere a new Ziff-Davis benchmark test program, ZD BatteryMark, Version 1.0, which will help answer this question. By using this benchmark program and its accompanying hardware, the new ZDigit II, we can accurately determine a portable battery's working life between charges. This combination also gives notebook vendors a single standard for accurately rating the battery life of their systems.

PC Magazine worked with the Ziff-Davis Benchmark Operation (ZDBOp), Ziff Davis's benchmark test-development group, to create BatteryMark. The goal was to create a battery-life testing protocol that is accurate, inexpensive, robust, and easy to use. We achieved these goals by combining software technology from our industry-standard benchmark test programs WinBench and Winstone with a simple mechanical device. The BatteryMark software measures a notebook's battery life, while the ZDigit II hardware repeatedly presses a notebook's keyboard to keep the system from going to sleep.

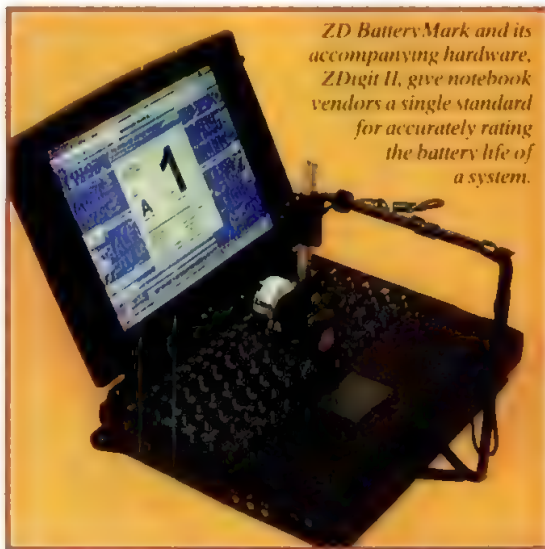
BatteryMark uses a great deal of ZD's existing testing technology, but it also keeps an eye on the future: The benchmark program executes a 32-bit workload under Windows 95. Where possible, BatteryMark also uses Advanced Power Management (APM) capabilities to make life simpler for testers.

CHALLENGES OF BATTERY-LIFE TESTING

Testing the battery life of portables presents unusual challenges that other benchmark tests never have to face. First, many notebooks suspend or go to sleep in some way, even if a program is running, unless they receive input from their keyboards. Thus, software alone won't do the job; you also need some kind of mechanical device to keep the portable awake. Another challenge is to obtain accurate test results from a machine that must run until its battery is exhausted.

When the power gets low, some systems stop running, others suspend operation, and still others just behave erratically.

In addition to measuring a notebook's battery life, you also have to be sure the notebook has been capable of useful work while running off its battery. A unit might activate so many power-saving options, for example, that it can do little useful work during the test. To avoid this problem, a battery-life test program must get some data on the amount of work the notebook was able to accomplish during the test. Doing the right work is also vital. A good



ZD BatteryMark and its accompanying hardware, ZDigit II, give notebook vendors a single standard for accurately rating the battery life of a system.

test program has to exercise notebooks with work that reflects the kinds of activities real users perform.

Power-saving options present another challenge. Even though different notebooks offer different sets of options, you must test them all with nearly identical power-saving settings in order to make a fair comparison.

You can't test a notebook fresh out of the box. To get an accurate measure of a notebook's battery life, you must first condition its battery, a process that involves fully draining and then fully charging several times. Finally, for our purposes it's vital that the test program be as automated as possible, because we test a lot of notebooks.

INSIDE ZDIGIT II AND BATTERYMARK

The ZDigit II hardware device makes it possible to keep a notebook's screen active at all times and keep the notebook from entering any sort of sleep mode. It does this by generating periodic keystrokes via a simple, slowly rotating motor connected to an actuator cam that presses one of the notebook's keys, typically the Spacebar. Its actuator resembles a star with four arms, and the motor assembly hangs off an adjustable metal stand. Setting up the device involves nothing more than adjusting the actuator cam to depress the Spacebar and plugging in the motor. The actuator rotates and depresses the Spacebar once every 15 seconds, while the BatteryMark software verifies that the notebook is receiving a keystroke every 15 seconds.

The ZDigit II is a highly reliable device. We have run one for over 1,000 consecutive hours without a hitch. It is available to the public, but because of its construction costs, we must charge for it (see the sidebar "How to get BatteryMark and ZDigit II").

BatteryMark provides simple measures of the amount of work accomplished during the battery-life test process so you can verify that the notebook actually kept working and didn't become useless. These measures are not full performance metrics (if you're interested in that, use one of our other benchmark test programs, ZD Winstone 32, Winstone 96, or WinBench

96); BatteryMark provides a quick impression of how much work was done.

BatteryMark exercises a notebook with three different software workload engines, one each for processor, disk, and graphics tasks. Each of these workloads is a 32-bit test based on the profiling we used in designing our Winstone test program. BatteryMark mixes these workloads together and adds periodic "think time"—breaks in the work that reflect the way users pause while working.

TESTING STANDARDS

To make fair battery-life comparisons, we employ a set of standard power management settings. You can pick different ones for your own test runs, but if your goal is to compare

How to Get BatteryMark and ZDigit II

The ZDigit II hardware and the BatteryMark 1.0 software are a team: ZDigit II presses a portable's Spacebar key regularly to simulate user activity, while BatteryMark tests the battery-life. You need both components to test a portable's battery life properly. The BatteryMark software is available free, but because of its manufacturing cost, the ZDigit II hardware requires a payment of \$300.

If you would like a copy of BatteryMark, Version 1.0, you can download it from the Ziff-Davis Benchmark Operation (ZDBOp) home page on the World Wide Web (<http://www.zd.com/~zdbop/>) or from the ZDBOp Forum on ZD Net, CompuServe Edition (GO ZDBENCH).

If you don't have a modem, you can have ZDBOp mail you a copy of the disk that contains the BatteryMark software, although you must pay a \$5 shipping and handling fee. To have a disk mailed to you, simply send a request to the following address:

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BatteryMark 1.0 software and are willing to pay the \$5 shipping and handling fee. Please allow four to six weeks for delivery. If you'd like faster delivery, enclose your Federal Express account number and Federal Express shipping instructions. The disk includes an electronic copy of the BatteryMark manual.

To purchase a ZDigit II testing device, which includes a copy of the BatteryMark software, send a request to the above address or fax number. Include your name, address, phone number, and MasterCard or Visa number, and indicate that you want the ZDigit II hardware and agree to pay \$300. All ZDigit II shipments go via two-day Airborne Express delivery.

several notebooks fairly, you should make their power management settings as consistent as possible. This can be tough, because not all notebooks offer exactly the same options.

During conditioning, we recommend either disabling all power-saving options or setting them to their maximum values. During battery-life test runs, we recommend the following:

- For the display time-out period (which doesn't really matter because the ZDigit II hits the keyboard every 15 seconds), we use 30 seconds.
- For the hard disk time-out period, use 2 minutes or the closest available value above that.
- For the suspend or time-out option, use the lowest number above the other time-out options above. Don't worry much about this one, though, because it should not come into play.
- For the CPU speed, use the Auto or Fast setting but not Slow.

You also have to consider the Automatic Power Management (APM) protocol when you test a notebook's battery life. The goal of APM is to help a notebook's BIOS, operating system, and applications share information about the unit's power status. BatteryMark uses APM where possible to automate its procedures and provide information. It checks to see whether a notebook supports APM; it may even ask your help in making this determination. If a system does support APM, BatteryMark tells you so and then uses APM information to display the battery status during charging and run-down portions of the test, to detect the presence of AC power, to provide reminders during the testing process, to eliminate user prompts when it can obtain system information programmatically, and to increase the accuracy of its battery-life measurement.

These features require an APM-compatible BIOS to work. Most current notebooks claim to support APM, but we've found that support is uneven. On many notebooks, for example, APM messages such as "power cable disconnected" can be quite slow to arrive. On better machines, such messages

you need to do is plug and unplug the notebook as appropriate and change the power-saving settings. BatteryMark does its best to lead you through all phases of its operation. If you've ever used WinBench or Winstone, the user interface will look familiar.

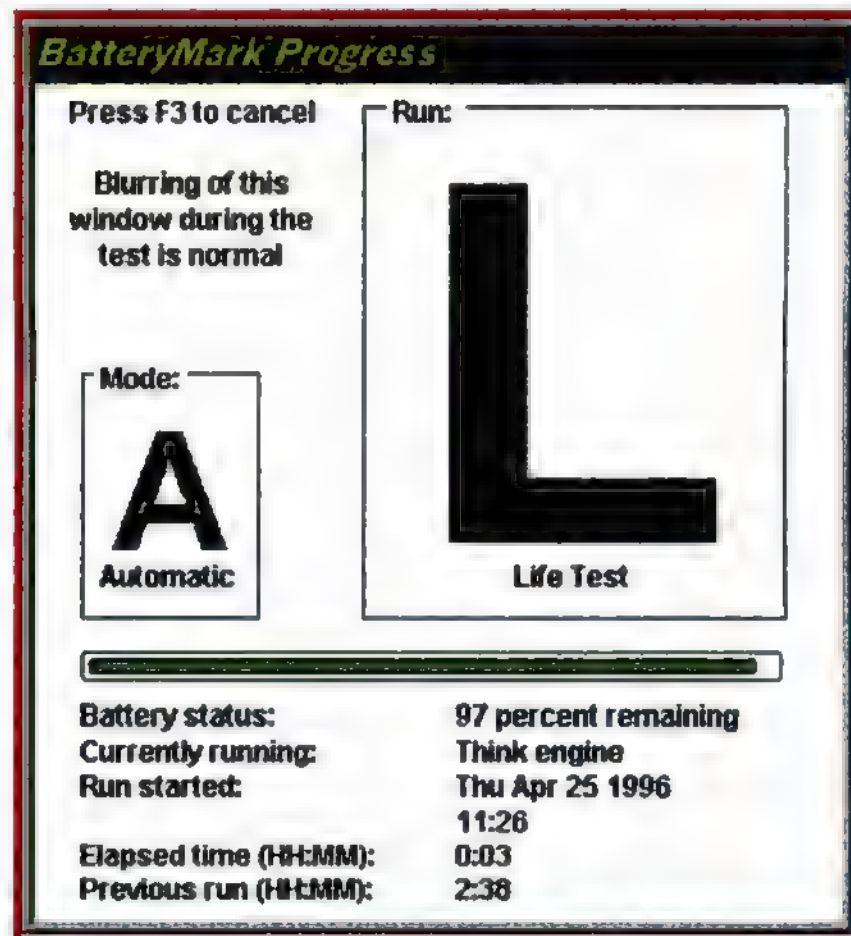
BatteryMark has two main operating phases: conditioning and life measurement. During the conditioning phase, the test puts as great a load as possible on the notebook's battery. The goal of this phase is to drain the battery completely two or more times. This process eliminates any so-called memory effects—incomplete charges that can result from charging an incompletely discharged battery. When two consecutive conditioning runs produce times within an acceptably close range (5 percent), the conditioning phase is considered complete.

It's vital that you fully recharge a notebook's battery after each conditioning run. Some systems may indicate via their charge lights that they are fully charged before they actually are, so it's best to let a unit sit a while even after it appears to be fully charged.

After conditioning the battery, BatteryMark performs one or more life-test runs. This phase is less demanding of battery power and more representative of actual system use. Consequently, life-test runs

typically take more time than conditioning runs on the same system. With careful preparation and execution, BatteryMark will provide accurate and repeatable results on the notebooks you test. □

Mark L. Van Name is vice president of product testing for Ziff-Davis Publishing Co. Bill Catchings is the director of the Ziff-Davis Benchmark Operation, a research and development division of Ziff-Davis.



BatteryMark keeps you informed of its progress using this dialog box.

occur within 5 seconds of the actual event; on others, these messages can take as long as a minute. Also, some machines report support for APM when Windows 95 queries their BIOSes but do not actually implement any APM commands.

USING BATTERYMARK

BatteryMark conditions a notebook's battery, determines when the battery is fully conditioned, and then runs its battery-life tests. All

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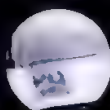
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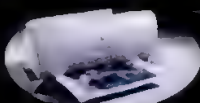
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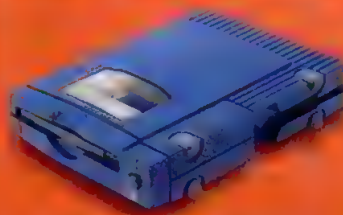
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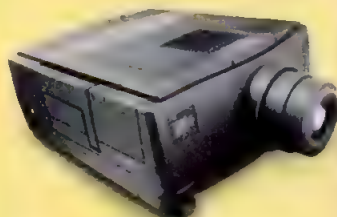


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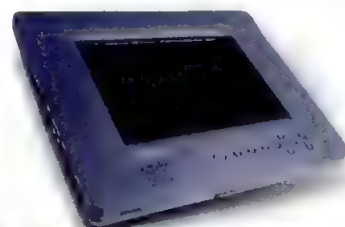
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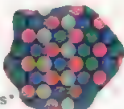
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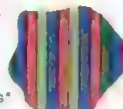
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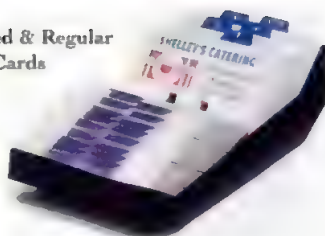


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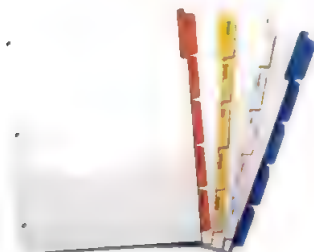
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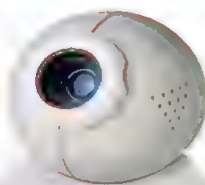


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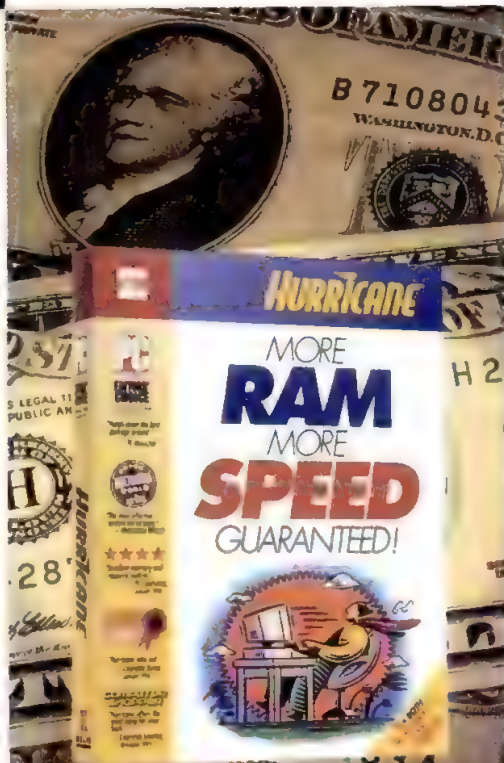
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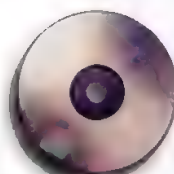
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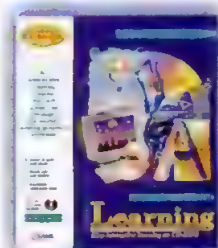
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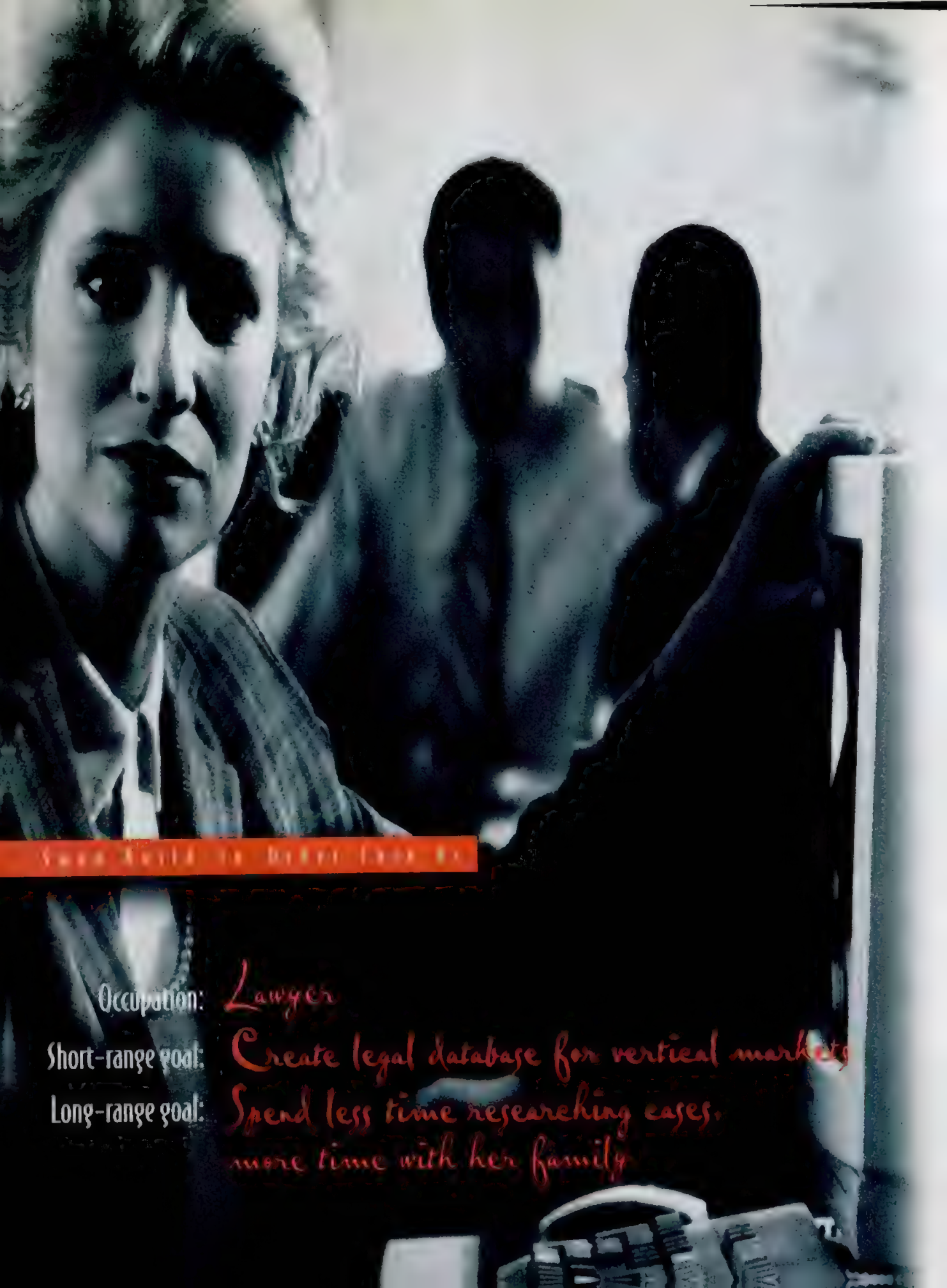
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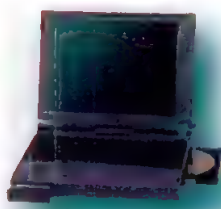


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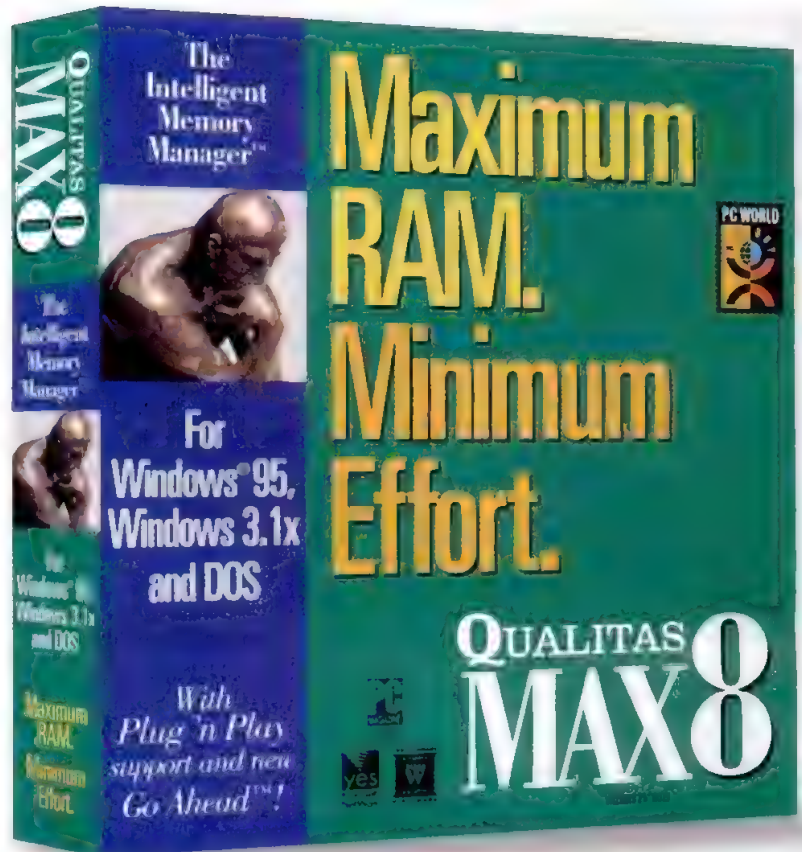
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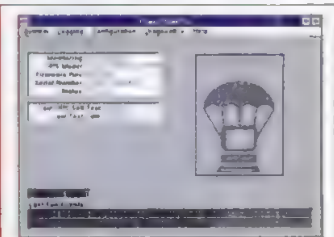
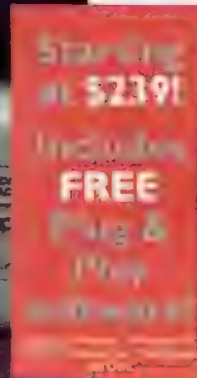
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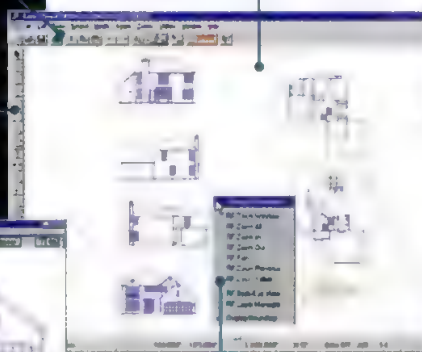


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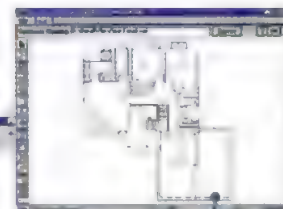
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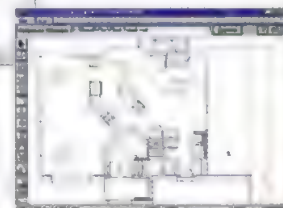
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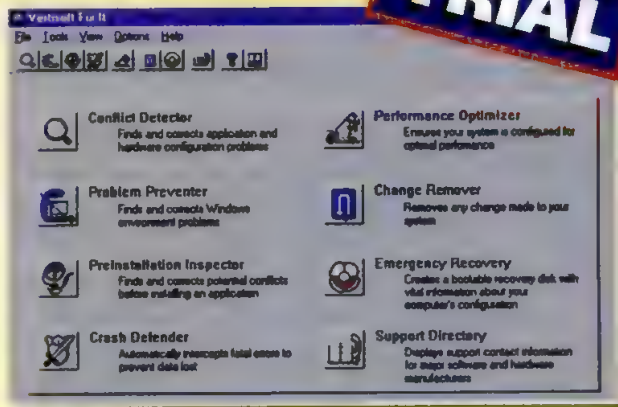
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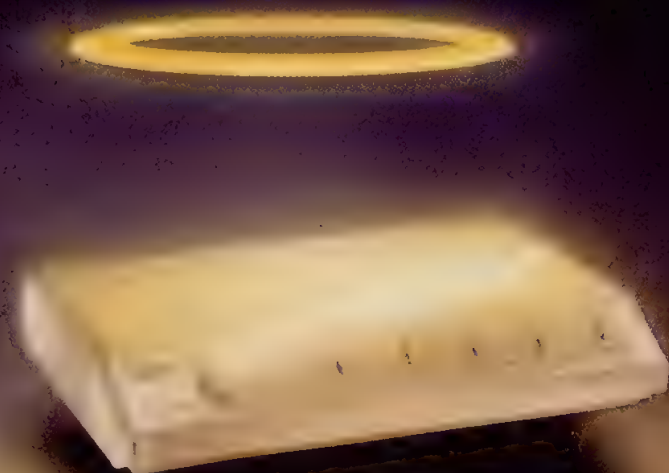
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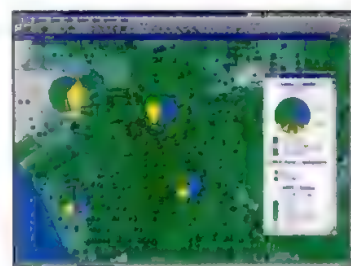
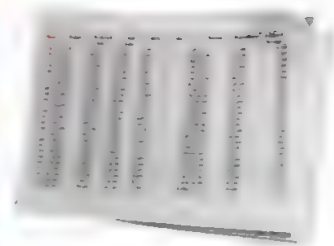
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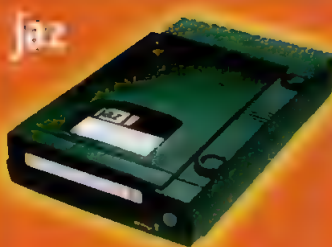
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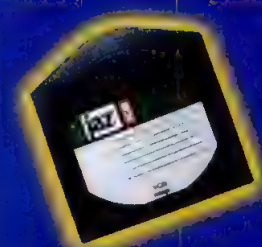


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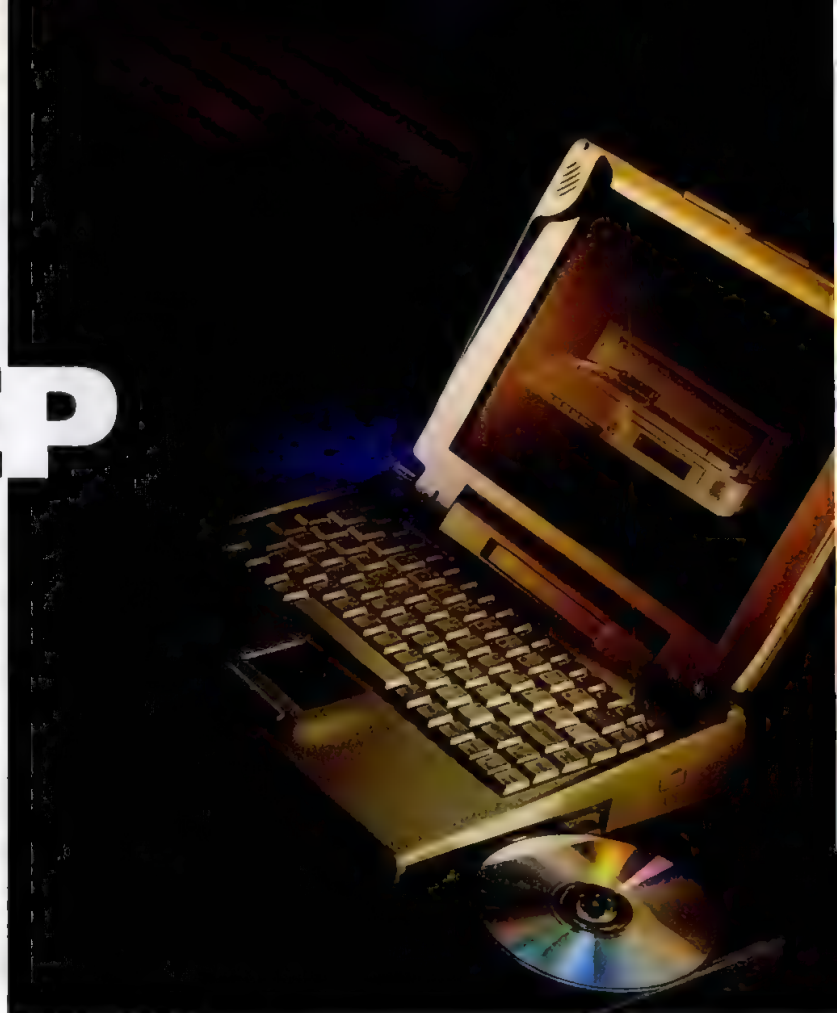


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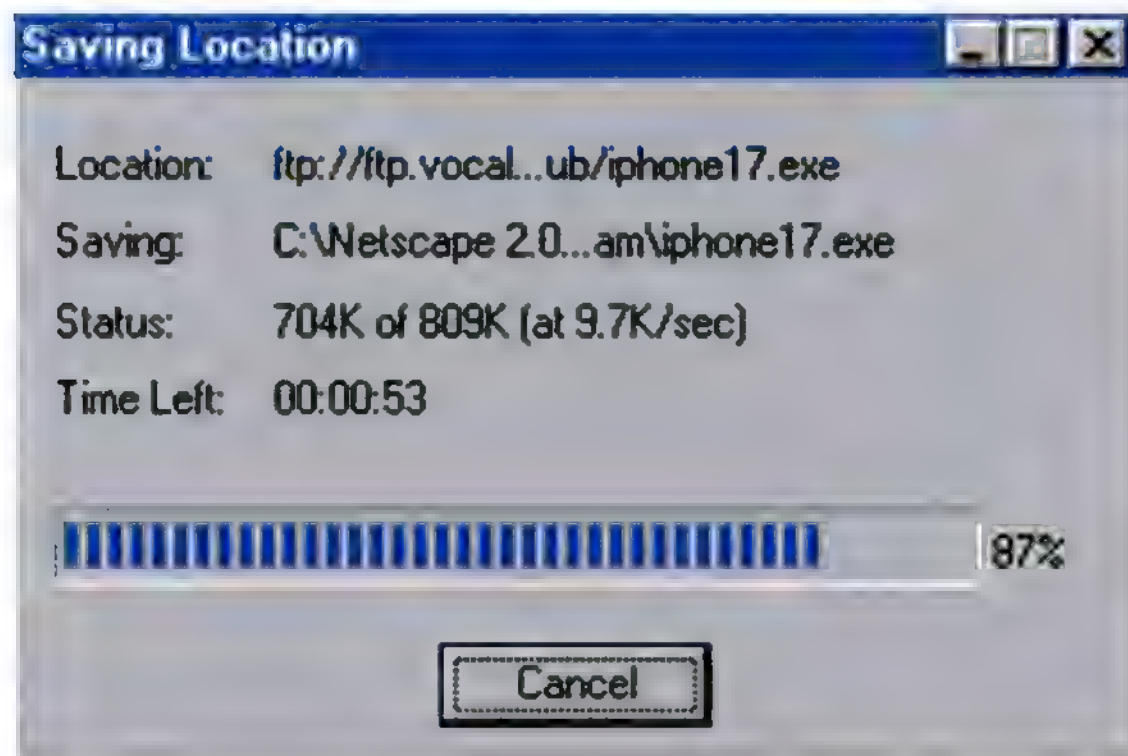
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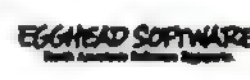
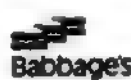
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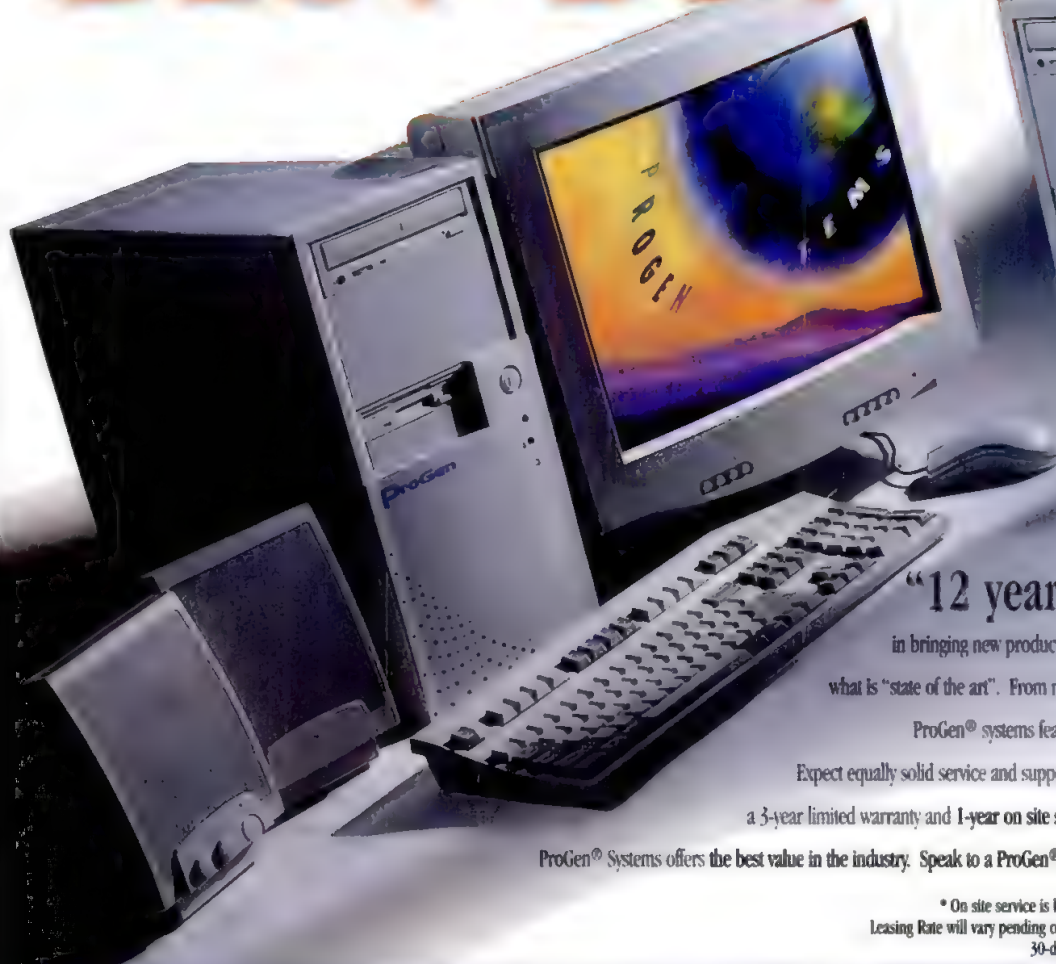
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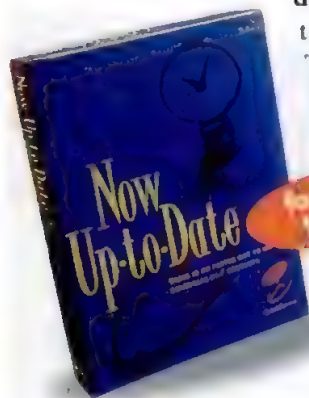
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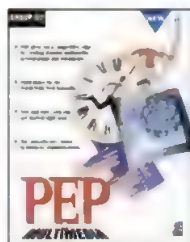
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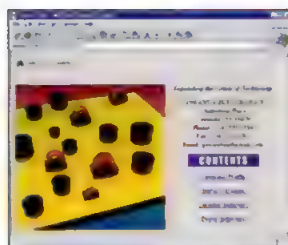
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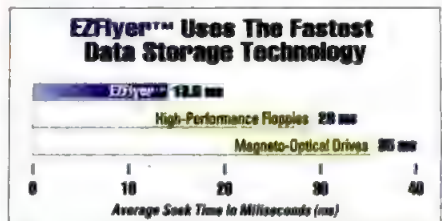
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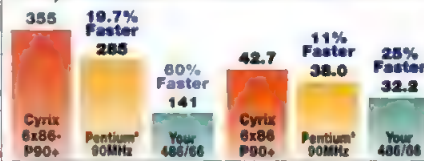
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chips. But unlike the Pentium Pro, the 6x86 is optimized for 16-bit and 32-bit Windows software. The fact is, Intel's Pentium Pro was built for systems that don't exist on the desktop yet. Cyrix's 6x86 was built for Windows 95, Windows 3.1 and DOS—all the applications that are important today and for many years to come. The 6x86 includes an 80-bit FPU for math calculations, 32 registers (versus 8 in the Pentium), dual pipelines for twice as many instructions as the Pentium, and lots of other technical advances. Bottom line: the Cyrix 6x86 is the fastest, fully compatible x86 processor in the world. Runs Windows 3.1, 95, NT, OS/2...

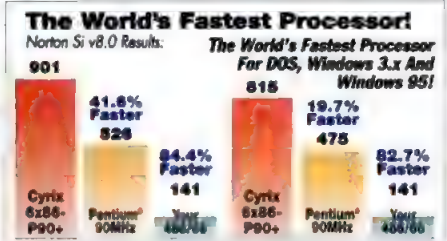
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6x86-P180+	PCI	Yes	4PCI, 4ISA	Yes	128MB	Yes	4	256 PIPELINED	Yes	Yes	4	Mid	200	A113-8686	\$799.99
6x86-P200+	PCI	Yes	4PCI, 4ISA	Yes	128MB	Yes	4	256 PIPELINED	Yes	Yes	4	Mid	200	A113-8670	\$999.99

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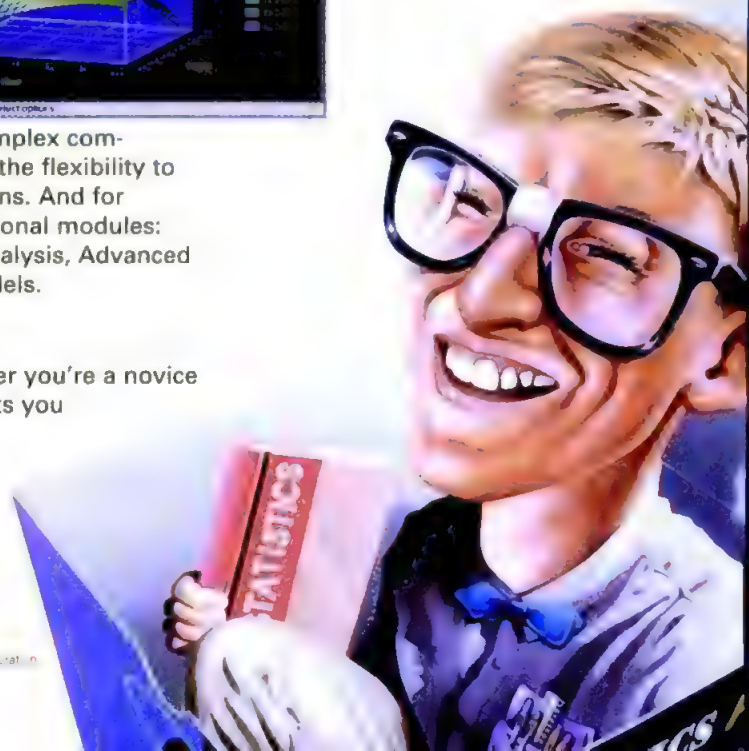
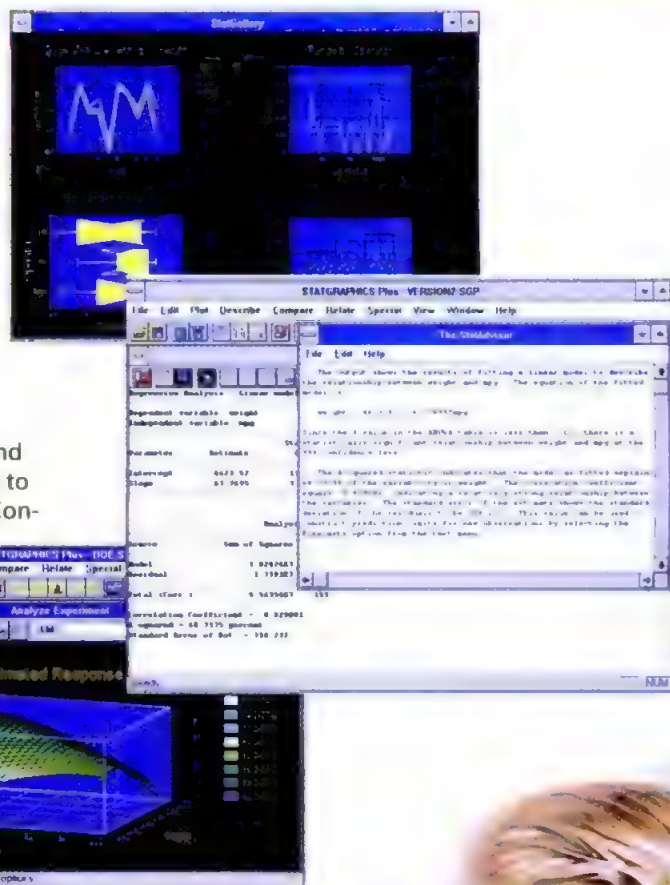
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User-to-User

By Neil J. Rubenking

Fixing Windows 95's Audio CD Auto-play Feature

I recently downloaded the Power Toys utilities from Microsoft's Web site. I tried the FlexiCD utility, hoping to give myself more control over my CD player when listening to audio CDs. I didn't like the program, though, so I removed FlexiCD using the Add/Remove Programs applet in the Windows 95 control panel. The next time I inserted an audio CD into my drive, I discovered that the auto-play feature had disappeared. Microsoft doesn't offer technical support for Power Toys, so I had to fix the Registry for AudioCD myself.

If you've encountered the same problem, here's an easy way to fix it: Using Explorer, select Options from the View menu and click on the File Type tab. Select AudioCD, click on Edit, and click on Edit again in the Editing action dialog. Change the play action to "C:\Windows\Cdplayer.exe/play %1," then click on OK, Close, and Close.

I-FENG KAO, Pullman, Washington

PC MAGAZINE: Power Toys is a collection of cutting-edge Windows 95 enhancements created by the Windows 95 team but not supported by Microsoft. You can download Power Toys from its dedicated Web page, located at <http://www.microsoft.com/windows/software/powertoy.htm>. An earlier User-to-User column mentioned the TweakUI Power Toy, which lets you tweak the Windows 95 user interface. Other Power Toys include the FlexiCD utility mentioned here, a Taskbar icon for quickly changing video mode, a round clock, and several enhancements to Explorer.

When you insert an audio CD into the CD-ROM drive, FlexiCD appears as an icon in the taskbar notification area. Clicking on the icon pauses or resumes play, and its ToolTip window shows the length of the current track and the amount played. From the right-click menu, you can skip and select tracks, start, stop, eject CDs, and so on. Unfortunately, FlexiCD lacks a number of features present in the Windows 95 CDPlayer program. Most importantly, CDPlayer can store the CD name and track names for each CD and will retrieve

the names automatically each subsequent time you insert a CD whose information it has stored. If you try FlexiCD and then uninstall it, you'll find that inserting an audio CD no longer auto-starts CDPlayer. That's when you'll need to apply this reader's tip.

Putting the FOR Command Through Its Paces

I have taken to using the FOR command to create one-line error-handling routines in batch files. My discovery that the colon (:) serves as a delimiter in some DOS commands, but not in the FOR command, made this possible. (For example, a colon separates the GOTO command and its label designation just as well as a space does.) In addition, some commands ignore extraneous characters on the command line; for example, everything after the label designation in a GOTO command is ignored. Thus, we have

```
for %v in (echo goto:End) do %v
➔Error message
```

The FOR command first echoes the error message and then executes the goto:End command. This approach replaces at least three lines: the test, a label, and the ECHO line.

It's also possible to extend this technique for other purposes. I often use it to create a tiny procedure that collects all of the command-line arguments into a single environment variable:

```
:Loop
if not '%1'=='' for %v in (set shift
➔goto:Loop) do %v
V=%V% %1
```

Of course, this approach has a big overhead with regard to DOS command lines' 127-character limit. If that's a concern, the SET part can be placed between the Loop label and the IF test:

```
:Loop
SET V=%V% %1
if not '%1'=='' for %v in (shift
➔goto:Loop) do %v
```

HIGHLIGHTS



HARDWARE If you have full-length expansion cards that won't fit in your new system, there is really only one thing you can do. *Page 388*



WORD PROCESSING Searching for and replacing codes in WordPerfect for Windows can be confusing. This quick review should help. *Page 393*



DATABASES The Fox Editor Enhancement Library for Visual FoxPro can do everything the missing Beautify feature could do—and much more. *Page 406*

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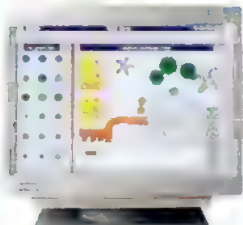
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Extrapolating from this understanding leads to a simple test that will allow the user to input a filename with or without a specific extension such as .COM. Specifically, the file test can be something like the following:

```
for %v in (%1.com* %1!@{?}) do %0 )
=>%v
```

If the filename is provided without an extension, "%1.com*" will match a .COM file. If the extension is provided, "%1.com!@{?" will match. The string "!@{?" is an attempt to guard against matching an existing non-.COM file with the wildcard test. In either case, if a match is found, the FOR command will re-execute the original batch file with the correctly extended filename. The closing parenthesis as the first argument of the recursive call will cause the FOR to be skipped the second time through the routine. The filename becomes the second command-line parameter with this change.

THOMAS LAVEDAS, Clifton, Virginia

PC MAGAZINE: Mr. Lavedas took the DIASM.BAT example from the User-to-User column of April 9, 1996, and seriously enhanced it. The improved version does not rely on any external files, accepts filenames with or without the .COM extension, and can process all .COM files matching a template. It is also incredibly complex (Figure 1 shows DISASM3.BAT in all its cryptic glory. This column isn't big enough to explain all of the techniques used in this remarkable batch file, so we'll stick to the variations on the FOR command.

In the first example, the FOR command plugs the values "echo" and "goto:End" into the expression following DO, yielding the two commands:

```
echo Error message
goto:End Error message
```

The first command displays an error message, and the second jumps to the label End, disregarding the extra text following the label name.

The two-line technique for collecting all command-line parameters into a single environment variable requires a bit more explanation. Suppose you passed the strings "Heloise" and "Abelard" to a batch file using this technique. Assuming the environment variable V is initially empty, the first time around the FOR loop would execute three commands:

```
set V= Heloise
shift V= Heloise
goto:Loop V= Heloise
```

The extra text on the command line following the shift and goto commands is ig-

nored. Shift moves all command-line parameters to the next-lower parameter, so the second time around the FOR loop will execute these commands:

```
set V= Heloise Abelard
shift V= Heloise Abelard
goto:Loop V= Heloise Abelard
```

All the parameters have now been shifted out, so the next time through the loop the first parameter will be empty, and the FOR command won't get executed. The variable V will contain all of the parameters in a single string.

The third example uses the FOR command's ability to replace a wildcard file specification with all files matching that specification. The batch-file line is:

```
for %v in (%1.com* %1!@{?}) do %0 )
=>%v
```

Suppose the user passes FOO.COM on the command line. When we replace the parameter symbols with their actual values, this line becomes:

```
for %v in (FOO.COM.com* FOO.COM!@{?})
=>do DISASM3 ) %v
```

The first item in the FOR list doesn't match any files, because it's not a valid filename. The second matches FOO.COM, because the characters after the three-letter extension are ig-

nored. So the batch file gets executed again, with a closing-parenthesis as its first parameter and FOO.COM as its second. Again replacing the parameter symbols with their actual values, we can see that the first line is now:

```
for %v in ( )...
```

There's no need to complete the line. When the first %1 is replaced by a closing parenthesis, the FOR command's item list is empty, and the rest of the line is ignored by DOS.

What happens if the user passes FOO without the .COM extension?

```
for %v in (FOO.com* FOO!@{?}) do
=>DISASM3 ) %v
```

The second item in the FOR command's list should not match any files, but the first matches FOO.COM. As before, the batch file is re-executed with a closing parenthesis as its first parameter and FOO.COM as the second.

Certain techniques involving undocumented features of the FOR command don't work in DOS 7 (the version that underlies Windows 95). However, everything shown here is completely documented and works fine in DOS 7. It takes a particular kind of mind to work out such elegant techniques using simple DOS commands!

You can download the batch file mentioned here from PC Magazine Online. See the sidebar "Guide to Our Utilities" in this issue's Utilities column for downloading instructions.

```
@echo %dbgd% off > %temp%.ax)
if [%1]==[] for %v in (echo goto:End) do %v Syntax: %0 COMFileName[* {?}]
for %v in (%1.com* %1!@{?}) do call %0 )1st %v
for %v in (1st 2nd 3rd) do if [%1]==[%v] goto )%v
if not exist %temp%.{f} for %v in (echo goto:End) do %v File %1 not found.
del %temp%.{f}
for %v in (echo. echo.Done. echo. goto:End) do %v
:)1st { Parse the file name.
}
> %temp%.comparing.bat echo %0 )2nd %2 %4
> %temp%.compari).bat fc %2 *.
> %temp%.{f} compari}
:)2nd { Determine the length of the COM file.
if not %2==%3.COM for %v in (echo goto:End) do %v %2 is not a COM file.
echo Disassembling %2 into %3.LST.
>>%temp%.ax) for %v in (r q) do echo %v
< %temp%.ax) debug %2 | find "AX=" > %temp%.ax}.bat
> %temp%.ax.bat echo %0 )3rd %2 %3 %5
%temp%.ax)
:)3rd { Disassemble the file.
}
>>%temp%.ax) for %v in (ul001%4 q) do echo %v
> %3.1st echo. Disassembled File: %2
>>%3.1st echo.
< %temp%.ax) debug %2 | find ":" >> %3.1st
:End
for %v in (%temp%.ax).* %temp%.ax.bat? %temp%.compari*.bat) do del %v
```

FIGURE 1: This cryptic batch file disassembles .COM programs using DEBUG. It requires that your TEMP directory be on the PATH.



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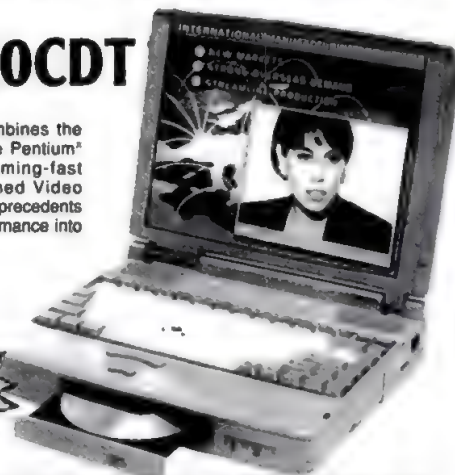
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HARDWARE

Boardroom Battle

 I recently upgraded to a Pentium system and discovered that some of my full-length expansion cards won't fit in the case; the cooling fan mounted on the CPU gets in the way. Are there any adapters on the market that will let me mount these boards either about an inch higher in the expansion slot or at an angle? Do you have any suggestions, or am I simply forced to replace these boards with shorter versions?

PHIL WILSON, via fax

PC MAGAZINE: Computer manufacturers often seem to ignore the physical requirements of older expansion cards, as more and more systems fail to offer unobstructed slots for full-length cards. Internal fixes are not likely to help, because the mounting brackets on the case won't be in the correct position. You could get an external expansion-card case, but these are expensive, and not all expansion cards will work in them. Unfortunately, the least-expensive solution in this case may well

be to simply replace the older cards with new, smaller ones. You might be able to get a performance increase in the process, which may take some of the sting out of the situation.
—Alfred Poor

Seeing Double

I'd like to install a second monitor in my PC so I can work with Windows on two screens at the same time. I know you can install a Monochrome Display Adapter (MDA) or a Hercules monochrome adapter in addition to a VGA card, but I want two graphics screens. Do you know if there is any way I can install a second card in my system?

GHJSELINCK CHRISTIAAN,
Gent Zwijnaarde, Belgium

PC MAGAZINE: There's no way I know of to install two standard VGA adapters in one system. The MDA/VGA approach works well, though the screens are not exactly simultaneous: DOS TEXT-mode images will appear on the MDA screen, and graphics modes will appear on the VGA monitor. Some programs—notably CAD applications—are designed to

take advantage of this split, but unless you can run an application in DOS in full-screen mode under Windows, it may not be that useful.

There's a new product on the market, from Appian Technologies, that allows you to connect two VGA (or SVGA) monitors to a single card, and then display different parts of your Windows workspace simultaneously. You can even install a pair of these cards to get four screens at once. For more information, see the First Looks review of the Impulse A2 graphics adapter in our issue of May 14, 1996. Alternatively, you can contact Appian Graphics by phone at 800-727-7426 or 408-985-1543, or on the World Wide Web at <http://www.appiantech.com>.—Alfred Poor

OPERATING ENVIRONMENTS

Managing Program Execution in a Windows 95 Batch File



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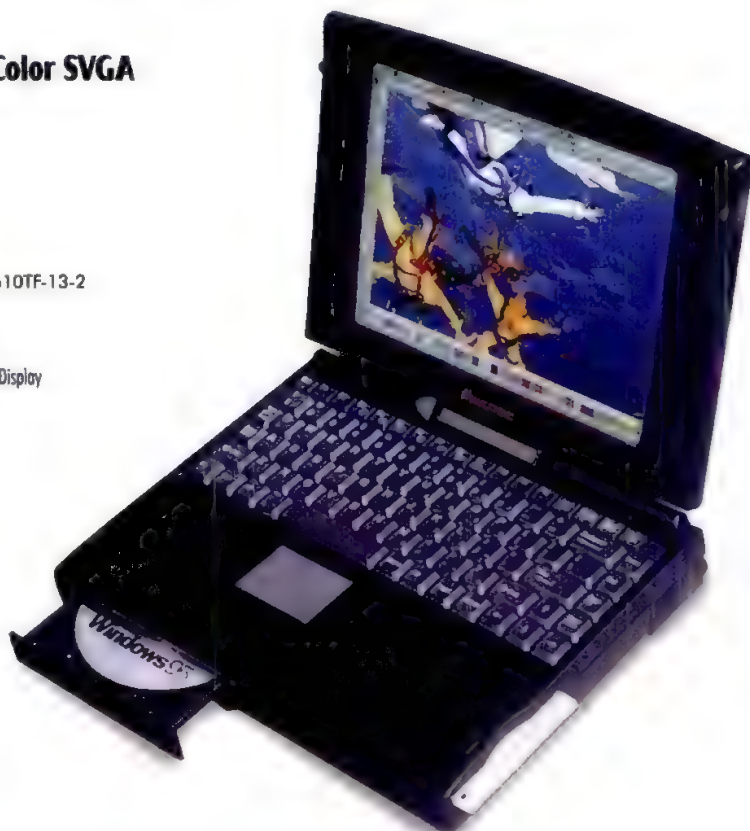
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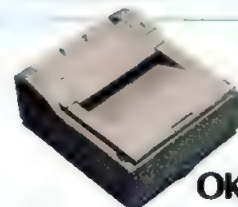
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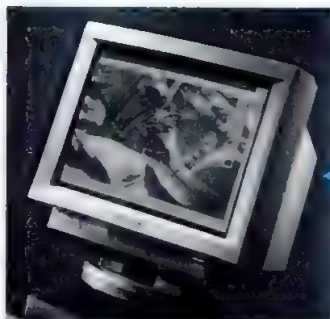


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file, which seems to be about 64K.

As a workaround, I created several .INI files named CDPLAYER.1, CDPLAYER.2, and so forth, and I constructed a batch file that will copy one of them over CDPLAYER.INI, run CDPLAYER.EXE, and then copy any changes back to the source file. I noticed that the batch file finishes execution before I close CDPLAYER.EXE and therefore any modification of the Play List—although saved in CDPLAYER.INI—is not copied to the source file. The updating of, say, CDPLAYER.1 should occur after CDPLAYER.EXE is closed. Can this be accomplished automatically?

WERNER P. HILTPOLD,
Boniswil, Switzerland

PC MAGAZINE: Indeed, .INI files are limited to 64K in size. It's rare for a program to hit that limit, except when the .INI file is being used as a poor man's database. That's precisely what CDPLAYER does, and that's where the problem lies. CDPLAYER stores several hundred bytes of information about each CD—just how much depends on the length of the track names you use. If your collection is substantial, 64K is just not enough space.

Using a batch file to run CDPLAYER and maintain multiple .INI files is a good idea. The catch, as you've noticed, is that after a Windows 95 batch file launches a Windows program, it goes right on to the next instruction, running simultaneously with the program it launched. The START command provides an effective solution, however. Insert "START /W" in front of the batch file line that launches CDPLAYER.EXE. The /W switch means Wait; this command launches CDPLAYER and waits until that program terminates before executing the next batch file command.

—Neil J. Rubenking

Read Windows Help Files Sequentially

Do you know of any utility that would allow an application's help file to be read on-screen like a conventional book, with one chapter following another? Hypertext links are great for investigating a particular topic, but cumbersome if you want to read all of the topics, which is required these days in the absence of printed manuals. If not, how about writing one for your Utilities section?

ALISON CHASE, via ZD Net

PC MAGAZINE: You don't need a utility to read help files sequentially. Just make one little tweak to WIN.INI and WinHelp itself can become a sequential help file browser. Here's how to enable this feature, which works with both Windows 3.x and Windows 95: Load WIN.INI into your favorite editor and locate the section titled [Windows Help]. If you don't

find a section with this name (and in Windows 95 you probably won't), simply create the header. Just after the [Windows Help] section header, insert this line:

```
SeqTopicKeys=1
```

Now restart Windows. Load the help file that interests you into WinHelp and open it to any topic. When you press Ctrl-Shift-Right, WinHelp advances to the next sequential topic in the help file. Ctrl-Shift-Home jumps to the very first topic in the help file. Ctrl-Shift-Left will back up to the previous topic in a Windows 95 help file, but not in a Windows 3.1 help file, even when running under Windows 95. However, the Back button will back up through any topics you've viewed in the current session.

The one possible problem with this approach is that some help files are just not arranged in any kind of internal sequence. It's possible for a help file developer to add new topics in no particular order, with the apparent order imposed later by means of jumps and browse sequences. The actual sequential order of the topics within the help file may not be meaningful, in which case no sequential help file reading utility could help.

—Neil J. Rubenking

Windows 95's Scary LOCK Command

In the User-to-User column of January 23, 1996, you explained how to load Windows 3.x on a computer that already has Windows 95 on it. I tried the method as outlined, and a very scary error message popped up relating to the LOCK command: "Windows has disabled direct disk access to protect long filenames. To override this protection see LOCK / ? command for more information. The system has been halted. Press Ctrl-Alt-Del."

I'm having difficulty locating any documentation on this command—it's barely mentioned in the Resource Kit. Can you please explain what the LOCK command is for?

SHELDON FINGERMAN,
Aspen, Colorado

PC MAGAZINE: Windows 95 uses a 32-bit file access system and long filenames. Programs that directly access the disk are making an end run around the file system and can indeed damage long filenames. Thus, Windows 95 traps any calls to the internal functions for direct disk access and displays that scary message. The LOCK command enables direct disk access to a specified drive. Before doing so, it asks for confirmation and presents an even more alarming message suggesting that disk corruption and data destruction are imminent if you answer Yes.

Fortunately, there is a way around this that doesn't require you to run the LOCK utility. What you need to do is install Windows 3.x without installing a permanent swap file. In order to speed up its virtual memory system, Windows 3.x stakes out a specific area on the disk for its permanent swap file and manages that area using direct disk access. Without the permanent swap file, you won't run afoul of the LOCK command. And since Windows 3.x isn't your main operating system anyway, it doesn't make sense to devote megabytes of hard disk space to its permanent swap file.

—Neil J. Rubenking

WORD PROCESSING

Changing Paired Codes In WordPerfect for Windows 6.1



I recently had to change italicized text to underlined text throughout a long document when submitting that document for publication. WordPerfect technical support insisted this can't be done, but I managed to do it anyway.

In WordPerfect, italics and underlines are paired codes, so italic text, for example, starts with an [Italc On] code and ends with an [Italc Off] code. Unfortunately, you can't simply search for all the [Italc On] codes and replace them with, say, [Und On] codes, and then do the same for the Off codes. If you try, you'll find that each time you replace one half of the pair, the other code disappears from your document. The solution, therefore, requires an intermediate step.

Start by choosing two characters or combinations you haven't used in the document. I'll use } and { in this example. Then find the first instance of italics, go to the Off code, and add } after the code. If you don't add this, you won't have a marker at this position, since WordPerfect will delete the first Off code when it replaces the first On code.

Next, use WordPerfect's Find and Replace feature to search for the [Italc On] codes and replace them with {[Italc On]. Then search for the [Italc Off] codes and replace them with [Italc Off]}. Now you can search for { and replace it with [Und On] codes, then search for } and replace it with [Und Off] codes. Finally, search for [Italc On] codes and replace them with nothing to remove all the italic codes from your document.

GREG GUNTHER,
Rolling Hills Estates, California

PC MAGAZINE: If you've painted yourself into this particular corner, Mr. Gunther's approach will certainly get you out of it. But if you're not already familiar with all of Word-

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ThinkPad 365XD	Pentium® 100	10.4" Dual Scan	8/40MB	540MB	4X	TrackPoint III	NIMH	6.2	1yr	IBT2625DEB	117.99	2,949.99
ThinkPad 365XD	Pentium® 120	10.4" Active Matrix	8/40MB	1.0GB	4X	TrackPoint III	NIMH	6.0	1yr	IBT2625DEF	143.51	3,899.99
ThinkPad 760EL	Pentium® 100	11.3" Dual Scan	8/72MB	810MB	-	TrackPoint III	Lith Ion	6.7	3yr	IBT9547U6G	125.11	3,399.99
ThinkPad 760EL	Pentium® 120	11.3" Dual Scan	8/72MB	1.0GB-R	-	TrackPoint III	Lith Ion	6.7	3yr	IBT9547U4F	180.31	4,899.99
ThinkPad 760ELD	Pentium® 100	12.1" Black Active	8/72MB	810MB-R	4X	TrackPoint III	Lith Ion	7.3	3yr	IBT9547U3F	165.99	4,499.99
ThinkPad 760E	Pentium® 133	12.1" Black Active	16/80MB	1.0GB-R	-	TrackPoint III	Lith Ion	6.8	3yr	IBT9546U4A	220.79	5,999.99
ThinkPad 760E	Pentium® 133	12.1" Black Active	16/80MB	1.2GB-R	4X	TrackPoint III	Lith Ion	7.4	3yr	IBT9546U3A	247.09	6,999.99
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Satellite 100CS	Pentium® 75	10.4" Dual Scan	8/40MB	528MB	-	Bit-in AccuPoint	NIMH	6.9	1yr	TA100CS	\$78.79	\$1,969.99
Satellite Pro 410CS	Pentium® 90	11.3" Dual Scan	8/40MB	810MB	Opt.	Bit-in AccuPoint	Lith Ion	6.8	3yr	TA410CS7	117.75	3,199.99
Portege 610CT	Pentium® 90	9.5" Active Matrix	8/40MB	720MB	-	Bit-in AccuPoint	Lith Ion	4.8	3yr	TA610CT8	118.86	3,229.99
Tecra 700CS	Pentium® 120	11.3" Dual Scan	8/40MB	1.2GB	Opt.	Bit-in AccuPoint	Lith Ion	7.3	3yr	TA700CS	142.37	3,889.99
Tecra 720CDT	Pentium® 133	12.1" Active Matrix	16/144MB	1.2GB-R	Bit-in	Bit-in AccuPoint	Lith Ion	6.0	3yr	TA720CDT	224.15	6,349.99
Toshiba Re-Manufactured												
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Satellite Pro T2135CS	486DX4/75	10.4" Dual Scan	8/32MB	520MB	-	Bit-in AccuPoint	NIMH	6.8	1yr	TA2135CSWB	55.99	1,399.99
Satellite Pro T2155GDS	486DX4/75	10.4" Dual Scan	4/28MB	520MB	Bit-in	Bit-in AccuPoint	NIMH	6.9	1yr	TA2155GDSB	63.99	1,599.99
Satellite Pro T2155GDS	486DX4/75	10.4" Dual Scan	4/28MB	520MB	Bit-in	Bit-in AccuPoint	NIMH	6.9	1yr	TA2155GDSWB	63.99	1,599.99
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Satellite Pro 400CS	Pentium® 75	10.4" Dual Scan	8/40MB	810MB	Opt.	Bit-in AccuPoint	Lith Ion	6.8	1yr	TA400CS7WB	99.99	2,499.99
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Satellite Pro 410CDT	Pentium® 90	11.3" Active Matrix	8/40MB	810MB-R	Remov.	Bit-in AccuPoint	Lith Ion	7.3	1yr	TA410CDT7B	150.87	4,099.99
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Tecra 700CS	Pentium® 120	11.3" Dual Scan	8/40MB	1.2GB	Opt.	Bit-in AccuPoint	Lith Ion	7.3	1yr	TA700CSB	136.15	3,899.99
Tecra 700CT	Pentium® 120	11.3" Active	16/48MB	1.2GB	Opt.	Bit-in AccuPoint	Lith Ion	7.3	1yr	TA700CTB	169.27	4,599.99
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Extrema 570CD	Pentium® 100	11.3" Dual Scan	8/40MB	810MB	6X	Touch Pad	Adv. NIMH	6.4	3yr	TEXT570CD	115.09	2,899.99
Extrema 570CDT	Pentium® 100	10.4" Active Matrix	8/40MB	1.2GB	6X	Touch Pad	Adv. NIMH	6.4	3yr	TEXT570CDT	144.62	3,929.99
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Ascentia J30	Pentium® 100	10.4" Active Matrix	8/40MB	800MB-R	-	"Track Stick"	Lith Ion	5.8	3yr	501946-401	113.63	2,845.99
Ascentia J50	Pentium® 133	10.4" Active Matrix	8/40MB	800MB-R	-	"Track Stick"	Lith Ion	5.8	3yr	501947-401	122.02	3,315.99
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Ascentia P50	Pentium® 133	11.3" Active Matrix	8/40MB	1.2GB-R	4X	Touch Pad	Lith Ion	5.8	3yr	501997-401	176.49	4,705.99
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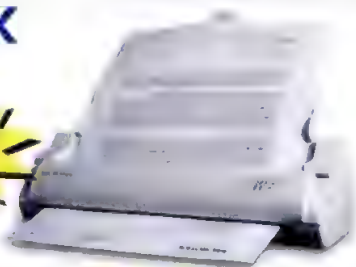
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Perfect's find-and-replace options, you may find it useful to go through some of the details, since the procedure for searching for and replacing codes is a little less obvious than it might be.

To search for a code and replace it with another code or with the same code plus some text, choose Edit | Find and Replace to open the Find and Replace Text dialog box. Choose Match | Codes to open the Codes dialog box. In the Codes dialog box, highlight the code you want to find (in this case, the [Italic On] code) and choose Insert to insert it in the Find text box. Next, go back to the Find and Replace Text dialog box (using the mouse or Alt-F6) and move the cursor to the Replace With box. Then return to the Codes dialog box, highlight what you seek to replace, and choose Insert to insert the code in the Replace With text box. You can then add any other text you need in the Replace With box.

Before you give the command to replace the codes in the document, you'll have to make sure the Action menu in the Find and Replace Text dialog box is set to Select Match. You'll also want to make sure the Direction menu has a check next to Forward and the Options menu has a check next to Begin Find At Top Of Document.

If you need to replace italics with under-

lined text more than once, you'll probably want to record all of these steps in a macro. To record the entire procedure, hit Ctrl-F10 to bring up the Record Macro dialog box, enter an appropriate filename in the Filename text box, and choose Record. When you're finished running through all the steps, hit Ctrl-F10 again to stop recording. And note that you can include the first step—adding that marker after the first [Italic Off] code—as part of the macro. Simply search for [Italic Off], then return to the document and type } or another marker character.

Not so incidentally, if you know beforehand that you'll need underlined text in the submitted version of a manuscript, but you still want to see the italics on-screen as you work, you might think it's a good idea to use a paired-character style to format the text with italics instead of using italics directly. In theory, changing italics to underlined text would then be a simple matter of redefining the style. That's not only easier than running multiple search and replace commands, it's also a lot faster.

Unfortunately, there is a danger to using character styles this way. Under some conditions, WordPerfect will add direct formatting codes instead of style codes when you try toggling the style on and off at various places in your text. If you then redefine the style,

you may be surprised at the results, since changing the style won't change the direct formatting codes. Because of these complications, you should stay away from character styles if you expect to redefine the styles.

—M. David Stone

SPREADSHEETS

Nested Subtotals in Excel



I'm having trouble creating nested subtotals with Excel's Subtotals command. The description in the manual is clear and works perfectly. But in the example used by the manual, at every break in the first field there's always a break in the second field. This isn't always true with my data, and the nested-subtotal feature fails when the second field doesn't change where the first field does. Figures 1 and 2 illustrate this problem.

Before subtotalling, the data in the table was sorted first by Salesperson, then by Type. In Figure 1, I've subtotaled the Sales field after every break in the Salesperson field. So far, so good.

Figure 2 shows the disaster that occurred when I added another subtotal to Figure 1. I subtotaled the Sales field again, this time after

	A	B	C	D
1	Salesperson	Type	Units	Sales
2	jones	bread	5	5000
3	jones	meat	10	10000
4	jones Total			15000
5	smith	meat	6	6000
6	smith	sugar	7	7000
7	smith Total			13000
8	wilson	bread	8	8000
9	wilson	meat	9	9000
10	wilson Total			17000
11	Grand Total			45000

FIGURE 1

	A	B	C	D
1	Salesperson	Type	Units	Sales
2	jones	bread	5	5000
3		bread Total		5000
4	jones	meat	10	10000
5	jones Total			15000
6	smith	meat	6	6000
7		meat Total		16000
8	smith	sugar	7	7000
9		sugar Total		7000
10	smith Total			13000
11	wilson	bread	8	8000
12		bread Total		8000
13	wilson	meat	9	9000
14		meat Total		9000
15	wilson Total			17000
16	Grand Total			45000

FIGURE 2

	A	B	C	D	E
1	Sum of sales	Type			
2	salesperson	bread	meat	sugar	Grand Total
3	jones	5000	10000	0	15000
4	smith	0	6000	7000	13000
5	wilson	8000	9000	0	17000
6	Grand Total	13000	25000	7000	45000

FIGURE 3

	A	B	C	D	E
1	Salesperson	Type	Units	Sales	
2	jones	bread	5	5000	
3	jones Total			5000	
4	wilson	bread	8	8000	
5	wilson Total			8000	
6		bread Total		13000	
7	jones	meat	10	10000	
8	jones Total			10000	
9	smith	meat	6	6000	
10	smith Total			6000	
11	wilson	meat	9	9000	
12	wilson Total			9000	
13		meat Total		25000	
14	smith	sugar	7	7000	

FIGURE 4

The Sales field is subtotaled after every break in the Salesperson field, and the subtotals are correct (see Figure 1). The Sales field is subtotaled again, this time after every break in the Type field; the results are incorrect (see Figure 2). The correct results, obtained using Excel's Pivot Table feature (see Figure 3). Sorting by Type first to get the correct results (see Figure 4).

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Pentium 133	11.3" Active SVGA	16MB/1.2GB	4499*

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- 16MB EDO RAM memory
- 12.1" Super VGA displays

Processor	Screen	RAM/HD	Price
Pentium 120	12.1" Dual Scan SVGA	16MB/1.3GB	\$3999
Pentium 120	12.1" Active SVGA	16MB/1.3GB	4999*

* Features 6X CD-ROM drive

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- Built-in 6X CD-ROM drive
- Pentium 100MHz processor
- 11.3" Dual Scan & Active Matrix displays
- Built-in SoundBlaster Pro compatible audio

Processor	Screen	RAM/HD	Price
Pentium 100	11.3" Dual Scan SVGA	8/810MB	\$2999
Pentium 100	11.3" Active SVGA	8MB/1.3GB	3899

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Pentium 100	11.3" Dual Scan SVGA	8/810MB	2299
Pentium 100	11.3" Active SVGA	8/810MB	2799

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Processor	Screen	RAM/HD	Price
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*Includes 16-bit stereo sound, microphone & speaker

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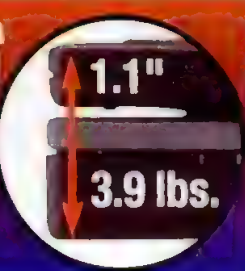
Processor	Screen	RAM/HD	Price
Pentium 100	10.4" Active	8/810MB	\$2999
Pentium 100	10.4" Active SVGA	8MB/1.08GB	3769
Pentium 120	10.4" Active SVGA	8MB/1.08GB	4059
Pentium 133	10.4" Active SVGA	8MB/1.35GB	4439

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Pentium 100	11.3" Dual Scan SVGA	8/810MB	2799*
Pentium 100	11.3" Active SVGA	8/810MB	2899
Pentium 120	11.3" Dual Scan SVGA	8MB/1.1GB	3299*
Pentium 120	11.3" Active SVGA	8MB/1.1GB	3699*

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- Infrared transceiver for wireless communication

Processor	Screen	RAM/HD	Price
Pentium 100	11.3" Dual Scan SVGA	8/810MB	\$2699
Pentium 120	12.1" Active SVGA	8/810MB	3749
Pentium 133	12.1" Active SVGA	8MB/1.1GB	4199



ThinkPad® 560

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TravelMate 6000

- 120 & 133MHz Pentium processors
- Up to 12.1" Super VGA Active Matrix displays
- Built-in 28.8 fax/modem
- 2MB video memory

Processor	Screen	RAM/HD	Price
Pentium 120	11.3" Active SVGA	8MB/1.1GB	\$4099
Pentium 133	12.1" Active SVGA	16MB/1.35GB	4889



TravelMate 6030

Extensa 510/570

- 100MHz Pentium processor
- Built-in 6X CD-ROM drive (570 models only)
- Windows for Workgroups OR Windows 95
- Built-in 16-bit audio, speaker & microphone

Processor	Screen	RAM/HD	Price
Pentium 100	10.4" Dual Scan	8/810MB	\$1999
Pentium 100	11.3" Dual Scan	8/810MB	2749*
Pentium 100	10.4" Active	8MB/1.2GB	3729*

* Features 6X CD-ROM drive



Extensa 570

NEC

NEC Versa 4000

Processor	Screen	RAM/HD	Price
Pentium 75	10.1" Active	8/810MB	\$3799*
Pentium 90	10.4" High Res.	8/810MB	3799
Pentium 90	10.1" Active	8/810MB	3999*
Pentium 120	10.4" High Res.	8MB/1GB	4099

* Features built-in 4X CD-ROM drive

NEC Versa 4000



NEC Versa 6000

- Up to Pentium 133MHz processors
- Built-in 6X CD-ROM drive
- 2MB video memory
- Built-in 28.8 cellular fax/modem

Processor	Screen	RAM/HD	Price
Pentium 100	12.1" Active SVGA	16MB/1.1GB	\$5399
Pentium 133	12.1" Active SVGA	16MB/1.3GB	5999
Pentium 133	12.1" Active SVGA	16MB/1.4GB	6499



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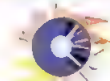
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- Up to 1.35GB hard drives
- Built-in infrared for wireless communications
- Supports NiMH batteries
- Optional MPEG and TV video adapter



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model

Processor	Screen	RAM/HD	Price
Pentium 75	10.4" Dual Scan	8/510MB	\$2830
Pentium 75	11.3" Dual Scan	8/810MB	3210
Pentium 75	10.4" Active	8/810MB	3589
Pentium 90	10.4" Active	8/810MB	3970
Pentium 90	10.4" Active	8/810MB	4340*
Pentium 120	10.4" Active	8MB/1.35GB	4720
Pentium 120	11.3" Active SVGA	16MB/1.35GB	5099
Pentium 133	12.1" Active SVGA	16MB/1.35GB	5669

* Features built-in CD-ROM drive



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- 100MHz Pentium processor

Processor	Screen	RAM/HD	Price
Pentium 100	10.4" Active SVGA	8MB/1GB	\$2999

* Features 28.8 fax/modem



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Milan

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- Up to 11.5" Super VGA displays
- Built-in 16-bit SoundBlaster audio
- Only 1.7" thick and 5.9 lbs

Processor	Screen	RAM/HD	Price
Pentium 100	10.4" Dual Scan SVGA	8/810MB	\$1999†
Pentium 100	10.4" Dual Scan SVGA	8/810MB	1999
Pentium 100	10.4" Dual Scan SVGA	8/810MB	2149*
Pentium 100	10.4" Active SVGA	8/810MB	2699†
Pentium 100	10.4" Active SVGA	8/810MB	2699
Pentium 100	10.4" Active SVGA	8/810MB	2849*
Pentium 120	11.3" Active SVGA	8MB/1.2GB	3599†
Pentium 120	11.3" Active SVGA	8MB/1.2GB	3599
Pentium 120	11.3" Active SVGA	8MB/1.2GB	3749*
Pentium 133	11.3" Active SVGA	16MB/1.2GB	4299†
Pentium 133	11.3" Active SVGA	16MB/1.2GB	4299
Pentium 133	11.3" Active SVGA	16MB/1.2GB	4499*

* Features 28.8 fax/modem

† Features Windows for Workgroups OR Windows 95



Monte Carlo

Monte Carlo

- Up to 133MHz Pentium processors
- Built-in 6X CD-ROM drive
- 2MB video memory
- 16MB RAM memory (selected models)

Processor	Screen	RAM/HD	Price
Pentium 100	11.3" Active SVGA	8/810MB	\$2999†
Pentium 100	11.3" Active SVGA	8/810MB	2999
Pentium 100	11.3" Active SVGA	8/810MB	3149*
Pentium 120	11.3" Active SVGA	16MB/1GB	4199†
Pentium 120	11.3" Active SVGA	16MB/1GB	4199
Pentium 120	11.3" Active SVGA	16MB/1GB	4349*
Pentium 133	12.1" Active SVGA	16MB/1GB	4999†
Pentium 133	12.1" Active SVGA	16MB/1GB	4999
Pentium 133	12.1" Active SVGA	16MB/1GB	5149*

* Features 28.8 fax/modem

† Features Windows for Workgroups OR Windows 95

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Processor	Screen	RAM/HD	Price
Pentium 100	11.3" Dual Scan SVGA	8/800MB	\$3299
Pentium 100	11.3" Dual Scan SVGA	8MB/1.2GB	3779
Pentium 133	11.3" Active SVGA	8/800MB	4249
Pentium 133	11.3" Active SVGA	8MB/1.2GB	4729

AST Ascentia J

- Integrated 14.4/4.4 data fax modem and audio
- PCI bus architecture with 256KB level 2 cache
- 10.4" SVGA (800x600) resolution Dual Scan and Active displays

Processor	Screen	RAM/HD	Price
Pentium 75	10.4" Dual Scan SVGA	8/500MB	\$2149
Pentium 75	10.4" Dual Scan SVGA	8/800MB	2349
Pentium 100	10.4" Dual Scan SVGA	8/800MB	2639
Pentium 100	10.4" Active Matrix SVGA	8/800MB	2839
Pentium 133	10.4" Active Matrix SVGA	8/800MB	3299

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Processor	Screen	RAM/HD	Price
Pentium 100	11.3" Dual Scan SVGA	8/515MB	\$2199
Pentium 100	11.3" Dual Scan SVGA	16MB/1GB	2799*
Pentium 100	11.3" Dual Scan SVGA	8MB/1GB	2999*†
Pentium 120	11.3" Active SVGA	8MB/1GB	3869*†
Pentium 120	11.3" Active SVGA	8MB/1GB	3999*†
Pentium 133	12.1" Active SVGA	16MB/1GB	5699*†

* Includes built-in sound system

† Includes built-in 4X CD-ROM drive

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Pentium 120	8MB/1.2GB	4X	\$1560
Pentium 120	16MB/1.6GB	6X	1850
Pentium 133	8MB/1.2GB	6X	1750
Pentium 133	16MB/1.6GB	6X	2050
Pentium 150	8MB/1.2GB	6X	1950
Pentium 150	16MB/2GB	6X	2340
Pentium 166	16MB/2GB	6X	2630

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- 64-Bit PCI Local bus graphics
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- Enhanced IDE interface for fast disk performance

Processor	RAM/HD	CD-ROM	Price
Pentium 100	8MB/1.2GB	6X	\$1399
Pentium 100	16MB/1.2GB	6X	1599
Pentium 133	16MB/1.2GB	6X	1799
Pentium 133	16MB/1.6GB	6X	1959
Pentium 150	16MB/1.6GB	6X	2149
Pentium 150	16MB/2.1GB	6X†	2399
Pentium 166	16MB/2.1GB	6X†	2519

† with 3 disc CD changer

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HP OmniBook 5000

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- Built-in 16-bit sound, microphone & speaker

Processor	RAM/HD	Price
Pentium 90	10.4" Active	8MB/1.2GB \$4449
Pentium 90	10.4" Active SVGA	16MB/1.2GB 4709
Pentium 120	10.4" Active SVGA	16MB/1.2GB 4939

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Processor	RAM/HD	Price
Pentium 120	10.4" Active SVGA	16MB/1.35GB \$5279
Pentium 120	11.3" Dual Screen VGA	16MB/1.35GB 4819
Pentium 120	12.1" Active SVGA	16MB/1.35GB 5789
Pentium 133	12.1" Active SVGA	16MB/1.35GB 5999
Pentium 133	12.1" Active SVGA	16MB/1.35GB 6479

HP OmniBook
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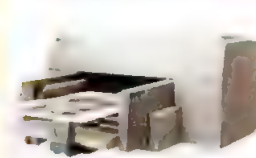
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every break in the Type field. Notice that the table now reports that Smith sold \$16,000 worth of meat (instead of \$6,000), and it includes no subtotal reflecting Jones's meat sales. In short, this is useless, and if I hadn't been alert, I could have submitted an inaccurate report based on Excel's faulty Subtotals command.

I did manage to get the correct results by using the Pivot Table feature (Figure 3), but I'd rather use Subtotals if I can make it work. Can you clarify?

MIKE BERRISFORD, Juneau, Alaska

PC MAGAZINE: The bottom line is that the Subtotals command is not as smart as it needs to be, as you have already discovered. And you also discovered the solution: If you want nested results, forget Subtotals and use a pivot table instead.

The SUBTOTAL function is designed to add up a column of cells while skipping over intervening SUM or SUBTOTAL formulas. So, for example, cell D5 in Figure 2 uses the formula

=SUBTOTAL(9,D2:D4)

to generate a subtotal for Jones. The function adds up D2 through D4 (the first argument, 9, tells it to add; you can also use the function to calculate averages, maxima, minima, and so on), but it ignores the value in D3 because there's another SUBTOTAL formula in that cell.

The Data menu's Subtotals command gives you a convenient way to apply the SUBTOTAL function. Like a wizard, the command asks you what you want to subtotal, and then inserts rows, builds formulas, and outlines the result for you automatically. The problem is that the command doesn't always know what range to put into the SUBTOTAL function's second argument. In D7, for example, it writes

=SUBTOTAL(9,D4:D6)

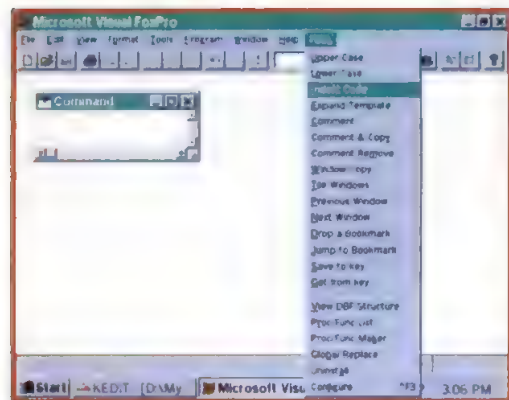


FIGURE 5: The Fox Editor Enhancement Library (FEEL) for Visual FoxPro provides a long list of needed improvements to Visual FoxPro's editing environment.

because it isn't clever enough to recognize that Smith's meat and Jones's meat don't belong under the same wrapper.

If you had sorted your data first on the Type field, then on the Salesperson field, you would have come up with the nested subtotals shown in Figure 4. The numbers are fine in this table, and you can use the outline buttons to manipulate the level of detail. But this table still lacks the clean simplicity of Figure 3. For summarizing numeric information on multiple fields, a pivot table is really the way to go.

—Craig Stinson

DATABASES

Getting The FEEL for Visual FoxPro

The March 26, 1996, column noted that the useful Beautify function in FoxPro for Windows had been removed from Visual FoxPro. You suggested replacing that functionality using the COB Editor Extensions, but this functionality also exists in the Documenting Wizard. Just click the Tools menu, select Wizards, then select Documenting. The wizard can beautify an entire project in one pass, or, if you prefer, it can beautify individual programs one at a time.

STEPHEN M. WALTON, Chicago, Illinois

PC MAGAZINE: That's true, but the Documenting Wizard does not a Beautify make. The documenting wizard, like FoxPro for Windows's Foxdoc program, is geared toward documenting whole files or projects, whereas the Beautify feature in FoxPro for Windows is much more singular in purpose and works directly on your active editor window. Thus, Beautify lets you splatter a bunch of sloppy code at high speed in an editor window and then, two clicks later, turn it into nicely indented code right where it sits. Even with the Documenting Wizard, I find I miss Beautify.

Luckily, I recently discovered the "Fox Editor Enhancement Library" (FEEL) for Visual FoxPro. This \$99.95 product, in late beta as I write this, installs onto Visual FoxPro's menu bar (Figure 5) and not only supplies the missing Beautify features but a host of other enhancements as well (Figure 6).

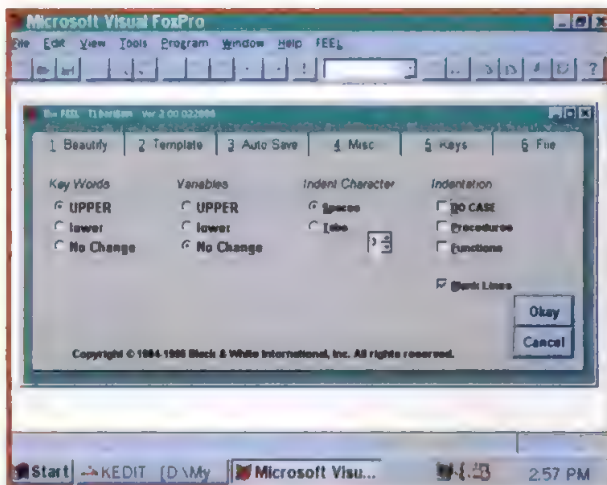


FIGURE 6: The Fox Editor Enhancement Library lets you auto-indent code and change the case of keywords and variables, much like the Beautify features in the older FoxPro for Windows.

Like Beautify, FEEL will indent your code according to your preferred spacing and change the case of keywords and variables. (You'll recall that the version of the COB Editor Extensions I looked at in March does not change the case of keywords.) You can also use the product to change blocks of text to upper- or lowercase, to comment or uncomment blocks, or to select a code block for further action. For example, if you press Ctrl-S at an IF, the entire IF-ELSE-ENDIF code block is selected.

You can quickly jump to a procedure or function in your code using the built-in function lister, create or jump to bookmarks, view .DBF file structures, and auto-expand keyword text into programming constructs. And, in my own testing, FEEL seems quite fast. For more information, contact Black & White International at 800-932-9202 or 212-666-4030.

—Sal Ricciardi

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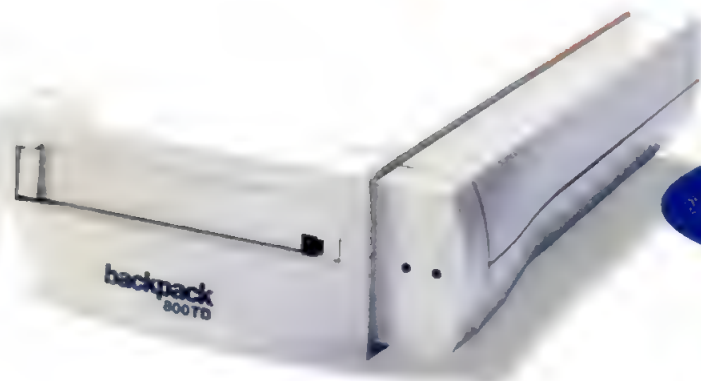


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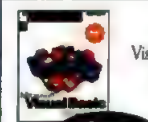
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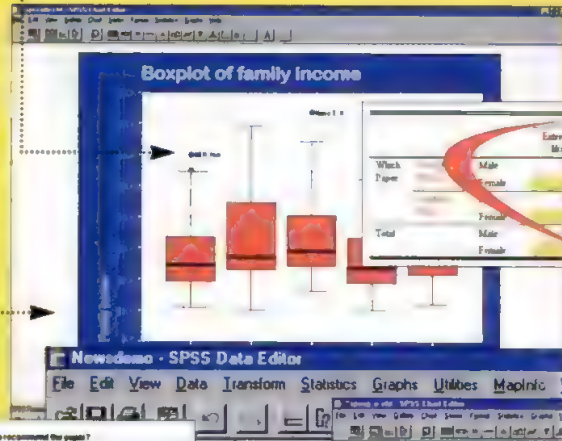
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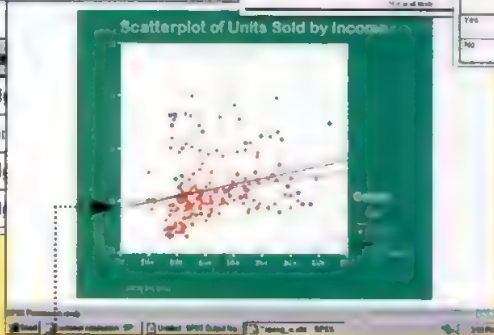
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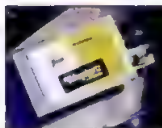


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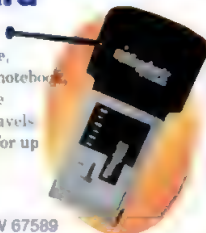
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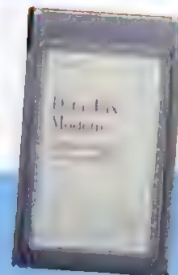
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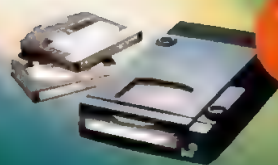
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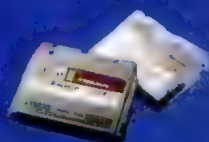
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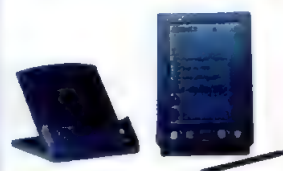
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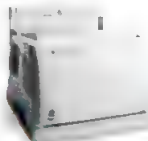
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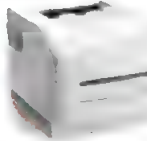


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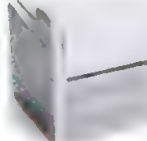


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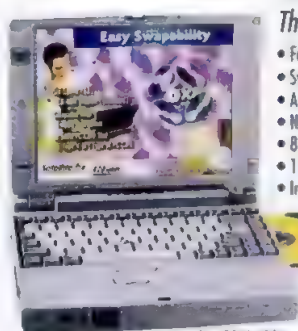
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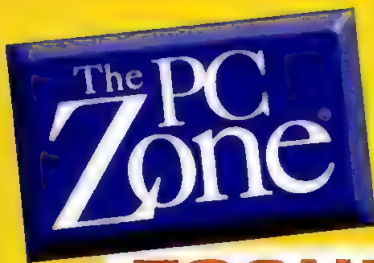


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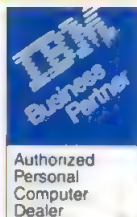
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Move up to 133MHz Pentium processor speed

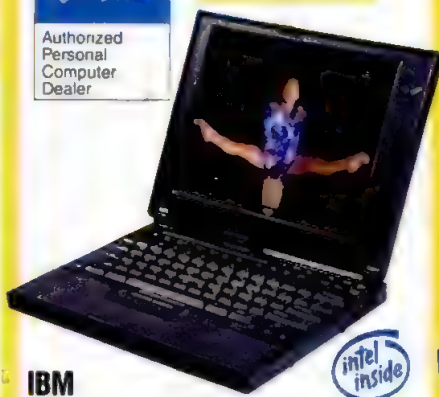
- Up to 133MHz Intel® Pentium® processor
- 8MB RAM Standard
- Optional CD-ROM drive available

Processor	Hard Drive	Screen	Order #	Price
P120	1.2GB	11.3" SVGA DSCAN	#27994**	\$3999
Or Business LEASE monthly for as low as \$160*				
P133	1.2GB	12.1" SVGA TFT	#32183	\$6299

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Options: 4X CD-ROM drive	#28685	\$329.98



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Affordability, modularity and performance!

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- 4X-6X CD-ROM drive included
- Integrated GlidePad pointing device

Processor	Hard Drive	Screen	Order #	Price
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823 Minitower	P133	1.6GB	#33565	\$1999
924 Minitower	P133	1.6GB	#33566*	\$2199
826 Minitower	P150	2.1GB	#33567**	\$2339
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P133	1.2GB	11.3" SVGA TFT	#33153	\$4749

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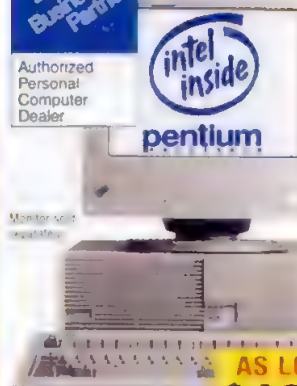
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Midtower	P133	1.6GB	#34827	\$2649
Midtower	P166	1.6GB	#34828	\$2799
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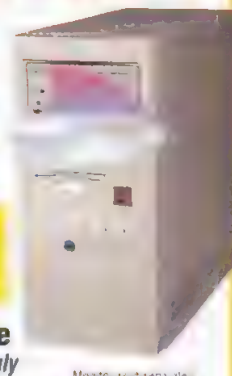
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Midtower	P100	1.6GB	#32011	\$1199.00
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Midtower	P166	1.6GB	#32039	\$2199.00

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Model	Processor	HD	Memory	Price
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Ready 7614	Pentium 150MHz	1.2GB	8MB RAM	\$1,900
Ready 9617	Pentium 133MHz	1.8GB	16MB RAM	\$2,000
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- 256K Pipeline cache

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PowerMate V100c	Pentium 100MHz	635MB	8MB RAM	\$1,200
PowerMate P120	Pentium 120MHz	1.2GB	16MB RAM	\$2,140
PowerMate P133	Pentium 133MHz	1.2GB	16MB RAM	\$2,240
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Model	Processor	Screen	HD/CD-ROM	Price
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PC-6220-01753	Pentium 133MHz	12.1 SVGA	1.35GB/4X	\$5,999
PC-6220-41003	Pentium 133MHz	12.1 XGA	1.44GB/4X	\$6,499

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- Removable Lithium Ion Battery
- 2 PC Card Slots
- VersaSlide™ Pointing Device with Palm Rest

Model	Processor	Screen	HD/CD-ROM	Price
PC-6100-11002D	Pentium 75MHz	10.1" TFT	810MB/4X	\$4,799
PC-6110-71002	Pentium 90MHz	10.4" Hi-Res TFT	610MB RAM	\$3,799
PC-6110-11002D	Pentium 90MHz	10.1" TFT	610MB/4X	\$3,999
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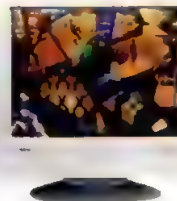


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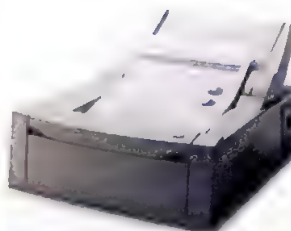
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Multisync M500	15" diagonal CRT	28 mm	1280 x 1024 NI	\$ 520
Multisync XY17+	17" diagonal flat square CRT	28mm	1280 x 1024 NI	\$ 610
Multisync M700	17" diagonal CRT	28mm	1280 x 1024 NI	\$ 680
Multisync XE21	21" diagonal flat square CRT	28mm	1024 x 768 NI	\$1,720



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- Multisync M900 15" \$799
- Multisync M920 17" \$1,699

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- BJC4100 \$375
- BJC600 \$495

Epson

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- Scanner 4000 \$595
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DX4-133	79	3v	33MHz	121-5v
Intel 486				
DX2-66	69	5v	33MHz	N/A
DX4-100	100	5v	33MHz	N/A
Pentium®				
75MHz	105			
90MHz	129			
100MHz	155			
120MHz	205			
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166MHz	545			
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Compaq 9660	\$2999	166Mhz	16MB	2.0	6X/28.8

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Model	Price	CPU	Memory	HD	CD/Modem
Platinum I	\$1799	133Mhz	16MB	1.2	4X/28.8
Platinum X	\$2099	150Mhz	16MB	1.6	6X/28.8
Platinum XI	\$2299	166Mhz	16MB	1.6	6X/28.8
PlatinumProXXI	\$2599	166Mhz	24MB	2.0	6X/28.8

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2100MB	E-IDE	10ms	64KVRAM	5200	WDAC32100A	319
2500MB	E-IDE	10ms	64KVRAM	5200	WDAC32500A	415
1275MB	E-IDE	12ms	64K	3600	CFS1275A	\$205
1620MB	E-IDE	14ms	64K	3600	CFS1621A	250
1084MB	E-IDE	12ms	128K	4480	MX71084AP	\$195
1336MB	E-IDE	12ms	128K	4480	MX71336A	210
1620MB	E-IDE	12ms	128K	4480	MX71626AP	249
2004MB	E-IDE	12ms	128K	4480	MX72004A	285

NOTEBOOKS

NEC Versa 4000

MODEL NO.	CPU	SCREEN	RAM/HD	PRICE
41402C	P-75	10.4" Active	8.540	\$2860
4080H	P-120	10.4" Active	8.1gb	\$4960

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MODEL NO.	CPU	SCREEN	RAM/HD	PRICE
5000 CTS	P-120	10.4" Active SVGA	16mb 1gb	\$5275
5000 CTS	P-90	10.4" Active SVGA	16mb 1gb	\$5175
6000 CT	486 DX4-75	9.5" Active	8.340	\$2499

Texas Instruments Extensa

MODEL NO.	CPU	SCREEN	RAM/HD	PRICE
560 CD	P-75	10.4" Dual Scan	8.810mb	\$2839
TM5100	P-90	10.4" Active SVGA	8.1 2gb	\$3695
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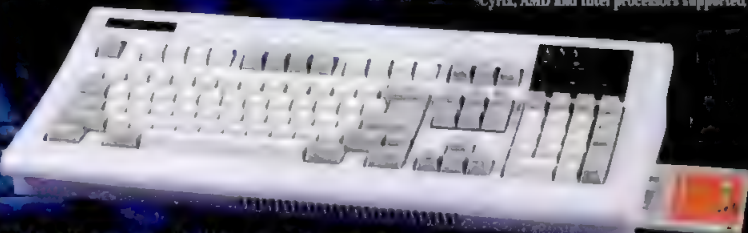
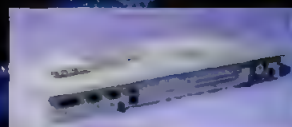
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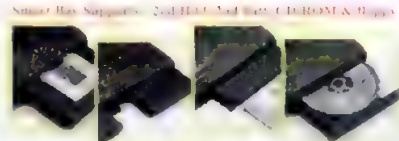
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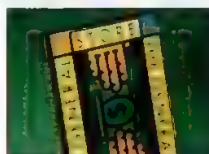
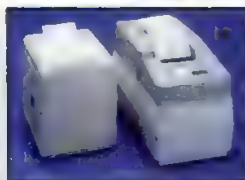
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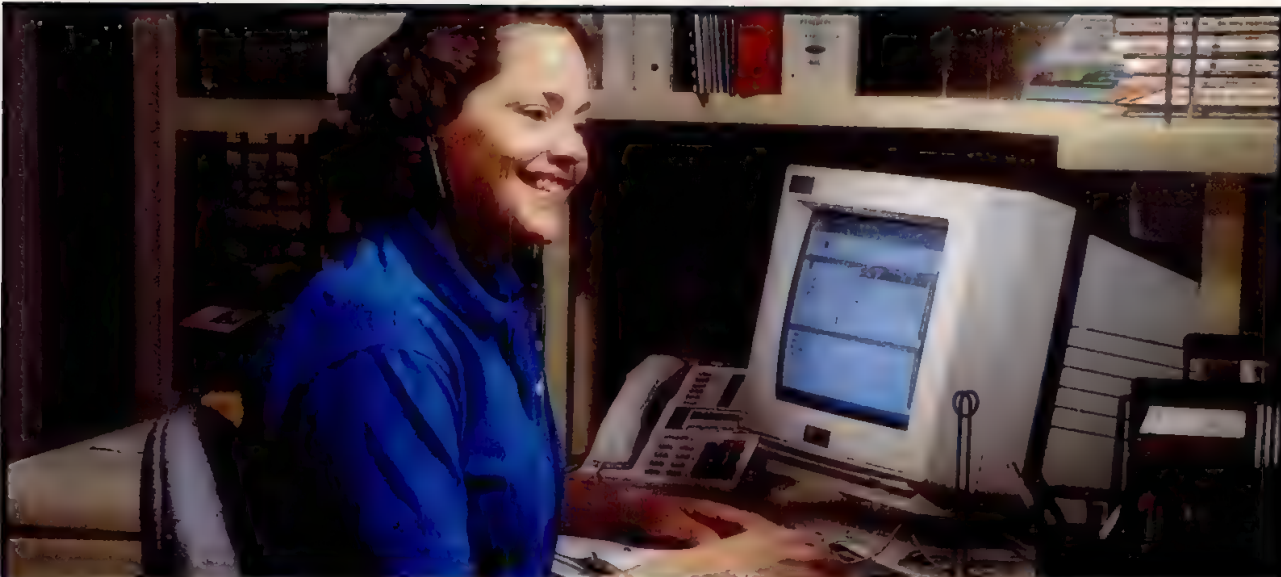
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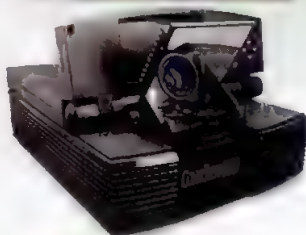
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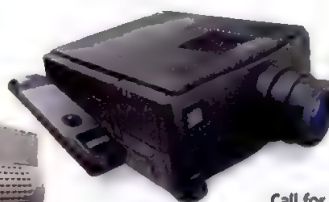
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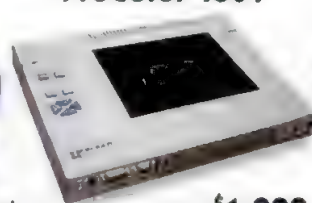
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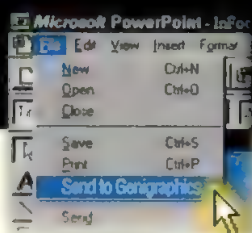
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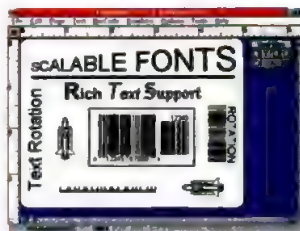
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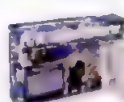
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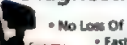
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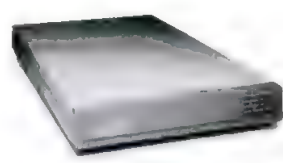


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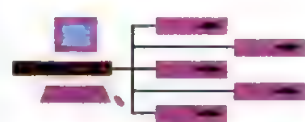
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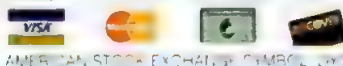
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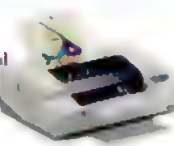
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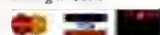
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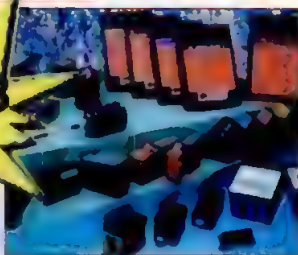
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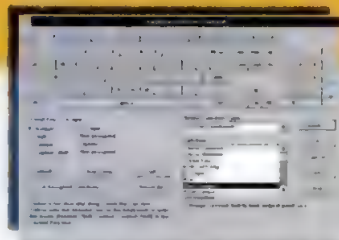
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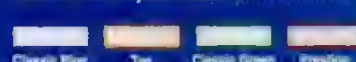
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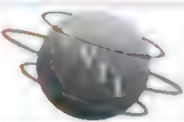
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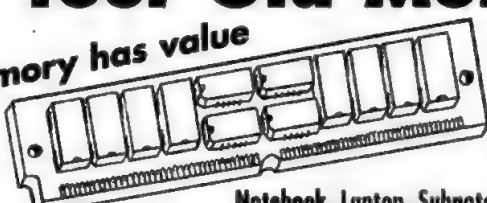
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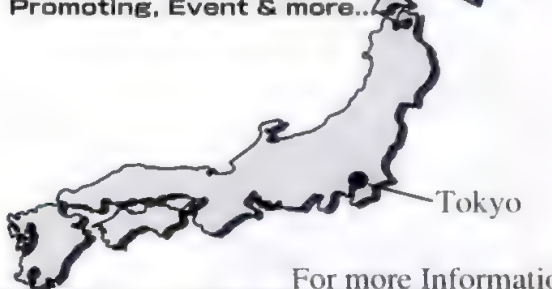
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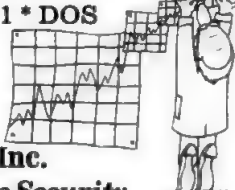


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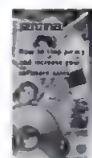


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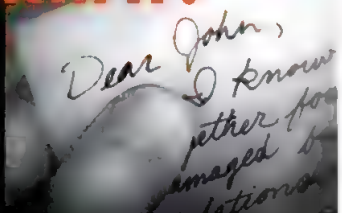
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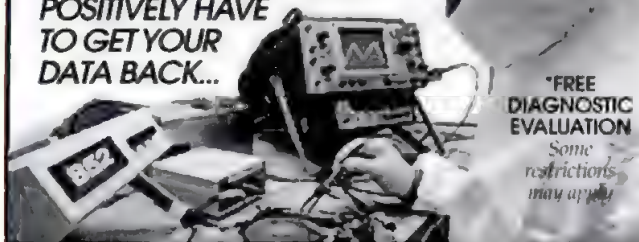
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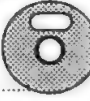
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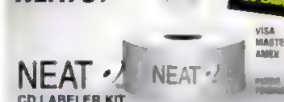
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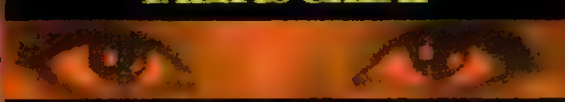
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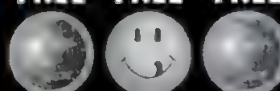
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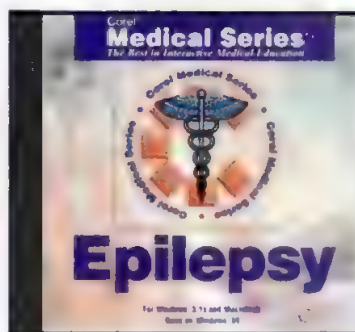
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At Home

A SPECIAL REPORT ON PRODUCTS FOR THE PERSONAL SIDE OF COMPUTING



When your children's summer smiles transform into fall grimaces, it can mean only one thing. The dreaded school bell is about to ring, and the prospect of trigonometry, saddle shoes, three-ring binders, and the cafeteria's mystery "meat" is making them sing the blues.

To help alleviate the schooltime blahs for you and your kids, we've scoured the vast collection of educational software titles and selected some of the best from the past year.

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Although many of these titles are suitable for various ages, we've grouped them by approximate grade level. We've also tried to cover as many educational categories as possible, from math and reading to logic and even graduate-level exams. All of the titles run on either Microsoft Windows 3.x or 95, or both.

Clicking Your Way to an A

By Angela Hickman

TODDLERS AND PRESCHOOL

It's Never Too Early to Start Learning

Even if your children are still too young for kindergarten, you can help get their education moving in the right direction. Let them enjoy learning by playing with one of these titles.

JumpStart Toddlers is an introduction to the computer for the very young user (aged 18 months to 3 years). In fact, Knowledge Adventure suggests you regard its product as "lapware"—something you can use with your child sitting on your lap.

Giggles the Gopher leads you and your child through seven play areas, including Numbers 1 to 10, Give the Dog a Bone, Peek-a-Boo, and Musical Instruments. The play areas teach basic computer skills and introduce toddlers to

with the mouse, the second teaches double-clicking and dragging, and the third introduces the keyboard.

There are 9 games, over 150 interactive screens, and 20 pictures to print and color. All three versions include a computer vocabulary section called Word Fun, which defines such words as *mouse*, *monitor*, and *cursor*. Animations accompany these definitions. Throughout the package, an alien named Cybee offers instructions and suggestions.

A to Zap! is an easy-to-use program for the child just



object to play a game that will reinforce the letter. Kids can also click on a camera to take screenshots and on a broom to clear the screen.

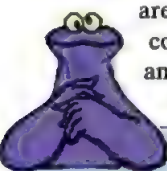
Parents can even customize **A to Zap!** easily by changing the case of the letters in the toy blocks, substituting different example words for each letter, and recording new sounds and pronunciations for each of the words and letters.

School Zone's Alphabet Express promises a trainload of animated fun while teaching alphabet and basic phonics skills. Mr. Conductor, the friendly alligator, serves as guide through

hidden-letter games also challenge letter-recognition and alphabetization skills. **Alphabet Express** is slightly more comprehensive than **A to Zap!** and is a good step up for the child who already has a pretty good grasp of alphabet basics but needs more practice.

Based on the children's book by Caralyn and Mark Buehner, **The Escape of Marvin the Ape** is the tale of an escaped gorilla in New York City. Unlike the other preschool titles in this section, **Marvin the Ape** is a storybook first and foremost, with the added benefit of educational games.

With 3-D animation and with narration by Jonathan Winters, the story unfolds in 14 comically illustrated frames containing activities and educational games. Three bookworms, Albert, Wendy, and Pablo, help guide children through Marvin's adventures at such places as the Statue of



Toddlers and Preschool

	Price	Company	Telephone	RSC #*
JumpStart Toddlers	\$34.95 direct	Knowledge Adventure Inc.	800-542-4240	534
My Very First Software	\$29.95 direct	Vroom Books	800-986-2537	535
A to Zap!	\$29.95 direct	SunBurst Communications	800-786-3155	536
School Zone's Alphabet Express	\$39.95 direct	School Zone Publishing Co.	800-253-0564	537
The Escape of Marvin the Ape	\$29.95 direct	Penguin Electronic	800-526-0275	538
Pantsylvania	\$29.95 direct	Headbone Interactive Inc.	800-267-4709	539
Sesame Street Get Set to Learn	\$34.95 direct	Creative Wonders	800-543-9778	540

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numbers, the alphabet, and vocabulary words.

Another title for the very young, **My Very First Software**, is strictly a computer tutorial for toddlers (although parents can probably learn a few things from it as well). The CD-ROM includes three versions of the program: The first teaches pointing and clicking

learning the alphabet. Each letter of the alphabet appears as a toy block. When children move the cursor over a block, the visible letter is spoken aloud; when they click on a block, an object starting with that letter pops out of a toy box, and its name is immediately spelled out.

Children can click on the

the title. Like **A to Zap!**, **Alphabet Express** represents each of the 26 letters graphically. Dot-to-dot, maze, and

Our Contributors: ANGELA HICKMAN is a staff writer at *PC Magazine*. MARY E. BEHR and MICHELLE SCHOENUNG are staff editors and MARY PAULSON is an editorial assistant at *PC Magazine*. BILL DYSZEL and KATHY YAKAL are frequent contributors to *PC Magazine*. MICHAEL E. RYAN was the associate editor in charge of this story.

Liberty and New York's Metropolitan Museum of Art. Marvin the Ape can be played in French, German, Spanish, or English; with its great graphics and entertaining games, it should prove appealing to children in any language.

Children of all ages will enjoy **Pantsylvania**. The fictitious kingdom of Pantsylvania provides the backdrop for a variety of educational activities. The kingdom consists of ten areas; in each of them, kids can take part in five activities. From the Fancy Pants Factory to the far reaches of Pantsuburbia, children can sing along with Kingamajig, engage in wordplay with Monkie Sue, or learn fascinating facts with Svelte Velma the Swine (we love the character and place names in this one).

Pantsylvania's many hid-

den hot spots may be a bit much for toddlers, but com-

puter-savvy three-year-olds will probably be transfixed for hours. And if you can tolerate the characters' helium-tinged voices, you may not be able to tear yourself away from **Pantsylvania** either. Everyone's favorite friends from the Children's Television Workshop are back in **Sesame Street: Get Set to Learn!**, the latest addition to Creative Wonders' popular Sesame Street series. With imaginative graphics and animation, **Get Set to Learn!** does not disappoint. Set up as a game show hosted by the loquacious Guy Smiley, **Get Set to Learn!** comprises five educational games, each moderated by a different Muppet. Children can add and subtract with Oscar the Grouch, learn shapes with Cookie Monster, or count with Big Bird and—of course—the Count.

As children master the basic skills, the games become more difficult. Meanwhile, a skill chart explains the learning concepts behind each game to make it easier for par-



den hot spots may be a bit much for toddlers, but computer-savvy three-year-olds will probably be transfixed for hours. And if you can tolerate the characters' helium-tinged voices, you may not be able to

ents to help their children.

This highly entertaining CD-ROM program even includes three "Sesame Street" songs, which you can play on your audio CD player.

—Michelle Schoenung

KINDERGARTEN THROUGH THIRD GRADE

Reading, 'Riting, 'Rithmetic (And Even Some Science)

As a child makes the big step into grade school, basic reading and math skills become more important, as do writing and science. The titles in this section will help you cover all those basics.

Creating stories is a great way for children to learn to read and write. **Kid Works Deluxe** helps kids create their own storybooks, complete with text, clip art, drawings, sound effects, and even animations with sound. The Story Starter suggests ideas to get kids under way. Graphical cues and icons guide the learner, with a few menus popping up to handle more complex features. A text-to-speech engine can read stories back to the writer, and children can add their own voice narration. Kids can also print their stories or even send them

to others using e-mail (but that requires a preconfigured Internet connection).

There are few more enjoyable vehicles for learning reading basics than **The Great Word Adventure**. Lil' Howie and his buddy Stinky take kids on a virtual ride through concepts such as rhyme, homonyms, word recognition, and capitalization.

The program's cartoonlike animation is first-rate. Lil' Howie and Stinky escort players through several unusual settings (such as a piece of cheese, where children can play Whack-a-Rat) while

teaching word skills through such activities as puzzles, songs, games, and word searches. As in its earlier title, **TuneLand**, 7th Level has hit on a winning combination of educational concepts and exceptionally engaging characters and activities.

Let's Explore the Jungle is an amusing graphics- and anima-



tion-based learning tool. This one should appeal to kindergarten kids and preschoolers alike.

Choose any part of the main interface and you zoom in on detailed scenes. Click on an animal or plant and it's animated. Some of the animations are just giggle-makers, while others represent characteristic sounds and behaviors of jungle flora and fauna.

The "What is this?" tool reads aloud additional information to the child, and a print button generates hard copy. For variety, kids can play any of five simple matching games.

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No reading ability is needed, since a well-animated character named Buzzy the Knowledge Bug guides users through every step. There's even an activity book.

Familiar French friend Madeline hosts **Madeline: Thinking Games**, which helps develop youngsters' thinking and creativity. Madeline invites players into her home and garden, where 11 activities await them. Several of these improve matching and memory skills. For example, players must find matching pictures of the ingredients that Madeline needs for a recipe or match pictures in the classroom.

The package teaches French and Spanish vocabulary as well, in a word and picture game. The program also encourages creativity as Madeline asks players to compose a tune on her piano, decorate a room, and color in her storybooks. The combination of activities, Madeline's warmth as

most popular kids' software series, **Scholastic's Magic Schoolbus Explores Inside the Earth** teaches basic geology and other science concepts. Children help Mrs. Frizzle and her class as they travel into the Earth searching for rocks and minerals and seeing canyons, volcanoes, and caverns along the way. Activities such as Fossil Animator (in which kids learn about prehistoric animals while solving puzzles) and a cave-

art creation tool will keep children interested for hours. Also, experiments and games reinforce the lessons. Colorful animations, lots of audio, and a creatively animated interface highlight this delightful title.



painlessly with humor, terrific 3-D animated graphics, and music that will appeal to its target audience. Two modes of play, free-form and structured, let parents adapt the program to a child's best learning style. Voice prompts and visual

controls make the program simple for unattended sessions, and off-line printed materials extend the learning process. Like the other Math Blaster products, this one will appeal to both parents and children.

Kindergarten Through Third Grade

	Price	Company	Telephone	RSC#*
Kid Works Deluxe	\$44.95 direct	Davidson & Associates Inc.	800-545-7677	541
The Great Word Adventure	\$39.99 direct	7th Level	800-884-8863	542
Let's Explore the Jungle	\$19.95 direct	Humongous Entertainment Inc.	800-499-8386	543
Madeline: Thinking Games	\$34.95 direct	Creative Wonders	800-543-9778	540
Scholastic's Magic Schoolbus Explores Inside the Earth	\$44.95 direct	Microsoft Corp.	800-426-9400	544
Math Blaster Jr.	\$44.95 direct	Davidson & Associates Inc.	800-545-7677	541
Reading Blaster Jr.	\$44.95 direct	Davidson & Associates Inc.	800-545-7677	541
Snootz Math Trek	\$34.95 direct	Theatrix Interactive Inc.	800-955-8749	547
Zurk's Rainforest Lab	\$33.00 direct	Soleil Software	800-501-0110	548

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controls make the program simple for unattended sessions, and off-line printed materials extend the learning process. Like the other Math Blaster products, this one will appeal to both parents and children.

Along similar lines, **Reading Blaster Jr.** uses phonics to teach early reading skills. Kids enter a spaceship full of games and entertaining 3-D animations and songs, which teach the basics of reading. Children learn letter sounds, word creation from sounds, word recognition, and sentence construction by playing games. Voice prompting and great visual clues guide exploration, while the animated characters entertain. A more structured mode is also available.

Snootz Math Trek consists of five play activities, two space aliens, a broken spaceship, and a clue-sniffing dog. Children team up with Flarn and Foozle, who have come to Earth from Planet Snoot on a mission. As their ship is being

street scene. **Snootz Math Trek** is primarily for kindergarten kids but may be suitable for even younger children. Older or more savvy kids may move through the title a bit too quickly to get anything out of it.

Rather than teaching one subject in detail, **Zurk's Rainforest Lab** does a little bit of teaching in a whole lot of areas. For example, one subject is animal classifications, habitats, and behavior. The rudiments of mathematics are introduced via a series of geometric puzzles that teaches about angles and shapes. Players can practice language skills by choosing voice-overs and word displays in English, French, or Spanish, and they can practice creative writing through activities such as describing the animals they've photographed.

Zurk's Rainforest Lab provides an effective play space in which young children can not only gain skills but learn about life sciences and other cultures.—Kathy Yakal



a hostess, and very attractive screens make Madeline a nice, gentle activity platform for younger children.

Continuing one of the

Introducing children early to numbers, counting, and other basic math concepts can give them a great head start. **Math Blaster Jr.** does the job

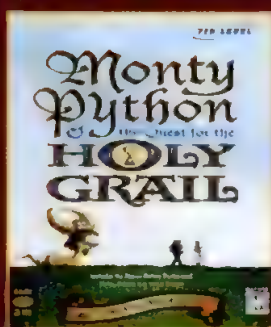


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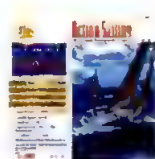


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FOURTH GRADE THROUGH JUNIOR HIGH

Beyond the Basics

During the last years of grade school and junior high, students will need strong problem-solving and logical-thinking skills. These titles address such skills and other areas vital to older kids.

Elroy Hits the Pavement doesn't teach traditional, quantifiable skills such as math and reading. Instead, it strengthens memory, logic, and decision making. An inept, offbeat crew of gangsters has nabbed Elroy's bloodhound, Blue, and children must help find him. Against a backdrop of colorful, blocky animations, players have to follow and remember clues while solving puzzles and breaking codes—and while learning about building batteries, creating fuels, and other real-world matters. Headbone Interactive has avoided a lot of the frustration and wasted time that often mar such meandering adventures, and it has built a mind-challenging program that will charm users young and old.

Using a quiz metaphor, **GeoSafari** teaches geography, history, and science. Students pick a topic, then match graphics, videos, and animations with

key words to learn dozens of basic topics ranging from map-based geography and famous leaders to human anatomy and rocks and minerals.

Multiuser modes enable cooperative and competitive learning. Correct answers bring additional information about the topic at hand. Voice prompts keep the student moving along while rewards, in the form of medals, provide incentives. **GeoSafari** should hold the attention of preteens and early teens.

Teaching children about ancient civilizations should do more than just present a new set of facts; it should also describe how people lived. **How**

Would You Survive? does both very capably. This well-produced multimedia title teaches about the ancient Egyptians, Aztecs, and Vikings. Through such vehicles as maps, movies, and animations, the package skillfully and artistically describes these societies' crafts, food, work, religion, medicine, and so on. When players have taken in enough information, they can play a round of "Have You Survived?"

Logical Journey of the Zoombinis teaches advanced mathe-

lessons they teach may very well help a child with real-life problem solving.

In just ten years, we've gone from dry, text-only reference materials on CD-ROM to lively, colorful, and engaging works of that ilk. **The Random House Kids Encyclopedia** combines flashy graphics, animation, video, and voice-overs with learning games—all wrapped around a core of searchable, browsable encyclopedia en-



Fourth Grade Through Junior High

	Price	Company	Telephone	RSC#*
Elroy Hits the Pavement	\$29.95 direct	Headbone Interactive Inc.	800-267-4709	539
GeoSafari	\$50 direct	Educational Insights Interactive	800-995-4436	983
How Would You Survive?	\$24.99 direct	Grolier Electronic Publishing	800-356-5590	545
The Logical Journey of the Zoombinis	\$39.95 direct	Broderbund Software	800-521-6263	546
The Random House Kids Encyclopedia	\$24.95 direct	Knowledge Adventure	800-542-4240	534
SkyTrip America	\$39.95 direct	Discovery Channel Multimedia	800-678-3343	549
Strategy Games of the World	\$39.99 direct	Edmark Corp.	800-426-0856	550
Thinkin' Things Collection 3	\$39.99 direct	Edmark Corp.	800-426-0856	550
3D Body Adventure	\$29.95 direct	Knowledge Adventure Inc.	800-542-4240	534
Type to Learn	\$34.95 direct	SunBurst Communications	800-786-3155	536

* For more information on any product, circle the specified number on the reader service card.

matical concepts without using dreaded phrases such as *algebraic thinking*. Players must guide the cute little Zoombinis to a new home, using multiple mathematical and logical processes to overcome 12 roadblocks. For example, to cross the Allergic Cliffs safely, players must first determine which set of Zoombini traits makes the cliffs sneeze and topple the crossing bridge, then build more Zoombinis that can succeed.

The **Logical Journey of the Zoombinis** won't exactly ensure that a child passes calculus, and the repetitiveness of guiding the Zoombinis through each obstacle may begin feeling like drill and practice, but the characters, settings, and obstacles are really fun. And the

entries are designed specifically for children and enable them to conduct searches in five ways: by time line, geographical location, alphabetical order, category, and the Kids Tours (a series of interactive exhibits that teach about various subjects). Graphical buildings house the activities; for example, games are in the **Encyclopedia Arcade**, and the multimedia encyclopedia is in the **Fact-ory**. This title is very nicely done and will be a definite asset on your kids' digital bookshelf for a long time.

For those looking to learn about U.S. geography and history, **SkyTrip America** is the right tool. Using attention-grabbing graphics, narration, and videos covering the entire country, this title is a great



Software for Students of Music



Children who play **Juilliard Music Adventure** (\$34.95) can learn musical concepts while finding their way through a kingdom of bizarre creatures and bewildering obstacles. Players learn such concepts as pitch, rhythm, and orchestration while helping to save a fantasy princess from a world without music.

Kids can also skip the game and play with the tools. They can drag and drop building blocks to assemble fragments of rhythm and melody, and then play them back with one of several colorful visual accompaniments. (Theatrix Interactive; 800-955-8749. *Circle 984 on reader service card.*)

IBM's **Kid Riffs** (\$31.50) is a game of musical exploration for 5- to 8-year-olds. By exploring the five houses in the program, you can learn five different musical concepts. In the Rhythm Room you can play different rhythms by clicking on the various posts in a picket fence. The Instrument House lets you hear different types of instruments and their families. In the Scale Shack, you can play songs in different scales by clicking on a frog and making it jump up and down a flight of stairs. Finally, the Mirror Mansion and the Concert Hall let you create all sorts of fascinating music by clicking different combinations. **Kid Riffs** is definitely not an academic experience. Kids can be totally absorbed in this game and learn without even realizing it. IBM Multimedia Studio; 800-426-7235. *Circle 985 on reader service card.*)

Menlo the Frog (\$39.95) is an interactive musical cartoon that's just plain fun for 3- to 7-year-olds. They won't even notice they're learning about pitch, rhythm, and beat as they join in the adventures of Menlo and his companion, Princess Winnicent, in this musical fairy tale. Menlo's first-rate ani-

mation and story line top those of the best television cartoons and will easily hold a child's interest through learning games and even simple musical compositions. This package is very well done, although we do recommend a quad-speed or better CD-ROM drive to enjoy it fully. (Windy Hill Productions; 800-354-6150. *Circle 986 on reader service card.*)

Passport Designs' line of music software includes several simple but useful titles, including **Play-a-Piece First Steps** (\$69). Intended to help take users through the first two years of piano lessons, **Play-a-Piece** is fairly well designed and easy to use. You don't need a MIDI keyboard to use **Play-a-Piece**; it accepts input from your QWERTY keyboard just as it would from a MIDI keyboard (but it's easier with MIDI). The title's 80 practice songs cover 5 levels of difficulty, but only the highest level requires you to play with two hands simultaneously. Though some users may find the title too simplistic, it can be helpful for absolute novices. (Passport Designs; 800-443-4320. *Circle 987 on reader service card.*)

Piano Discovery System (software only, \$79; with keyboard, \$199) takes the lesson plan of the old Miracle Piano Teaching System—the most popular program of its kind—and makes it even easier. You'll have fun learning about notes and chords by playing arcade-style games. Then you'll move on to actual songs, which you'll learn to play while the system monitors your progress. When you're ready, you can perform your masterpiece with orchestral accompaniment in a simulated concert hall, followed by thunderous simulated applause. The 200-lesson package takes you through your first year of instruction and is plenty of fun for all ages. (Jump! Music; 800-289-5867. *Circle 988 on reader service card.*)—Bill Dyszel

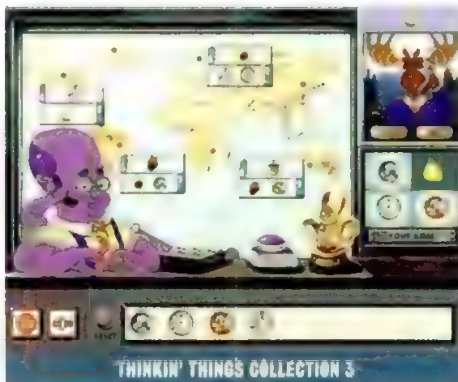
learning aid. Users pick a hot-air balloon, a spaceship, or a funny-looking flying car and set out to explore the country. Enhanced by games and narration by several celebrities, the program offers nearly endless possibilities for exploration. At every stop, clicking on highlighted features in the main screen takes the user to deeper levels of information, all of which can be copied to a journal or to the Clipboard. The program is addictive and makes learning these topics a pleasure.

As the title suggests, effective strategy development is the goal of **Strategy Games of the World**. The program consists of

three games that originated in other parts of the world: Nine Men's Morris (Egypt), Go-Moku (China), and Mancala (Africa/Middle East). Players can compete against the computer or against a real second player, and they can solicit the advice of animated creatures.

People who work in such disciplines as botany and athletics appear in brief videos, sharing their experiences in developing strategies.

This title aims to improve children's logic skills, helping them identify patterns and



predict outcomes. The setting and game play are intriguing and rewarding enough to keep kids thinking.

Good production values and a variety of unusual learning activities make **Thinkin' Things Collection 3** an excellent choice. Each of the five real-life activities appeals to a different age group. In *The Case of the Empty Fripplie House*, for example, young children can build analytical skills and practice reading while trying to solve the case. In another activity, called *Stocktopus*, a large, purple octopus (who is also a stockbroker) helps young children practice logic and deductive reasoning as they trade portfolio items. Older children can learn computer-programming basics as they orchestrate a football

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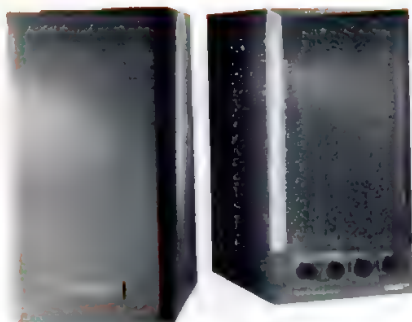
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halftime show, and they can experiment with physics properties in the Carving BLOX world. Thinkin' Things Collection 3 is an innovative, challenging learning ground that can help a child grow.

3D Body Adventure is an exciting visual exploration of the human body. Players can use the mouse to see parts of the body from all angles and can use the package's 3-D glasses to see fairly vivid three-dimensional detail. From a detailed rendering of the torso to excellent, MRI technology-based illustrations of other parts of the body, everything is on display. Details on each anatomical system are available as either text or spoken words and with rotating illustrations. And the program offers 3-D flights through most of these systems. There's even an emergency room game in which the user gets to be a life-saving medic. This is a must-see product, but it may be somewhat advanced for most elementary-school students.

Type to Learn is a good tool for teaching typing basics. It uses 3-D hand and keyboard displays to teach the basics, with voice prompts providing instructions and corrections. Games make progress fun while also teaching some geography, astronomy, and other general topics. But the program's interface, which uses standard Windows menus, is not as intuitive or friendly as some multimedia educational software.

Though it's not as engaging as Typing Instructor Deluxe CD (see the section "High School and Beyond"), the package still offers all the tools you need to learn keyboard skills, and it does a good job of tracking and reporting your progress.—KY

HIGH SCHOOL AND BEYOND

Finishing Up, Planning Ahead

At this point, most students are concerned with getting through their most difficult classes and choosing (or being accepted into) a good college. These titles should ease some of the anxiety.

The Cartoon Guide to Physics not only makes the dreaded subject of physics easy to understand but also makes it fun. Created by best-selling author Larry Gonick, this humorous program teaches the basic principles of physics and reinforces them through games and puzzles. The program covers such topics as motion, projectiles, Newton's third law, energy, and collisions. Historical information, a trivia game, and a comprehensive glossary round out this intelligent and engaging program.

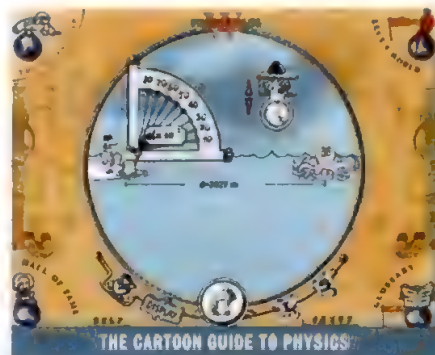
Taking the SAT is only half the battle for the college-bound student, who still has to pick a school. **College Advisor** suggests colleges according to students' individual and

views, directories, a reference library, and access to the Web. **CollegeEdge** will help students apply to a college that suits them.

CollegeEdge steps users through seven key stages of the college preparation and application process. The title includes an overview of over 240 careers; information on courses of study, admission criteria, and available majors for over 3,200 two- and four-year colleges. It also contains a review of tuition and financial packages and a list of over 3,800 private scholarships. **CollegeEdge** includes its own organizer and can even help students

write letters to colleges.

Learning a new language is a daunting task, but **French to Go!** can help. This title is ideal for beginners who need a well-rounded introduction to the French language. As you follow the video lessons, you learn French by listening and reading. For a break from lessons, visit La Galerie, which houses



scholastic background, interests, and aspirations. Based on 56,000 student surveys, **College Advisor** provides detailed information on more than 1,200 colleges and includes a copy of Netscape Navigator to help link you to hundreds of college Web sites.

CollegeEdge Personal Edition, another tool for selecting a college, is remarkably comprehensive. With the aid of inter-

information on French history and culture, along with games and activities to keep you practicing. Another section, the Cabaret, is particularly helpful: It allows you to record your voice and then play it back to get immediate feedback on your progress.

High School and Beyond

	Price	Company	Telephone	RSC #
The Cartoon Guide to Physics	\$39.95 direct	HarperCollins Interactive	800-424-6234	989
College Advisor	\$19.95 direct	The Princeton Review	617-272-7027	990
CollegeEdge Personal Edition	\$49.99 direct	SNAPI Technologies Inc.	800-734-7627	991
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Typing Instructor Deluxe CD	\$40.00 street	Individual Software Inc.	800-822-3522	997
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Schoolhouse Web



As you help your kids gather their pencils, notebooks, and other supplies for the approaching school year, don't forget to check out the Web. Museums, homework helpers, reference guides, and support groups abound online, making the Web a perfect place for kids to seek fun, guidance, and alternative educational experiences. The sites listed below are just a few of our favorites.

As one of the most celebrated learning sites on the Web, **The Exploratorium** (<http://www.exploratorium.edu>) offers teachers and students a fun and provocative way to experience art, science, and technology. The Learning Studio's Top Cool Sites! index of science, art, and educational sites will be sure to whisk you to mind-bending exhibits, such as the link What's New in the World of Science. You can download plenty of cool images and Real Audio files, but hands-on exhibits are the real specialty.

Though **Britannica Online** (<http://www.eb.com>) costs a hefty \$150 a year—not including a \$25 one-time registration fee—the depth of the content may validate the price for some users (or their parents). The site includes the venerable *Encyclopædia Britannica*'s database of 65,000 articles, as well as articles written exclusively for online (spanning topics ranging from Freud to Mount Everest). Unlike the CD-ROM version of the encyclopedia, the site offers lots of photographs, maps, and diagrams. Speedy natural-language and Boolean searches help guide you through this mammoth site.

Youngsters interested in archeology, biology, and sociology should check out the **Field Museum of Natural History** site (<http://www.bvis.uic.edu/museum/Home.html>). This site includes online exhibits that are chock-full of colorful JPEG graphics and interesting MPEG movies. The site also provides a companion book list for precocious kids who want to read more about the subjects of the exhibits. Teachers guides that suggest pre- and postvisit activities are also accessible from the site.

The Education Place (<http://www.hmco.com:80/hmco/school/index.html>) is a great one-stop site for those who like to have fun while they learn. The site features brainteasers, daily vocabulary quizzes, and a geography game called GeoNet, which asks aspiring mapmakers questions like, "Is Washington D.C. south of the Northeast Region?"

Teenagers with something to say about politics, sports, entertainment, or technology should visit the **Youth Central** site (<http://www.youthcentral.apple.com>). Youth Central's bulletin boards and pen-pal service allow kids from all over the world to correspond and to participate in discussions on a wide range of topics. Expect lively chats, especially in the Tech Triangle, where young Macintosh users square off with their PC counterparts over the (digital) age-old question: Which is better?

Finding content on the Web without a good search engine is like trying to find a needle in a haystack. That's why the producers of **The Homework Page** (<http://www.tpoint.net:80/Users/jewels/homework.html>) set up this site. It's designed to take the daily grind out of finding useful

resources for book reports and essays by providing indexed, categorized lists of links from such search resources as Galaxy, Virtual Library, and Yahoo!

If little Jimmy still isn't getting long division after long hours of study and weekly tutorials, maybe Dr. Math can help. The **Dr. Math** site (<http://forum.swarthmore.edu/dr.math>) is run by a group of students at Swarthmore College who answer questions from struggling students about homework, puzzles, and math contests. Like any good teacher, though, the folks at Dr. Math don't just hand over answers. Instead, they ask

students to e-mail them descriptions of problems and how they tried to solve them. Then the Dr. Math crew fires back with hints or suggested solutions.

If you're looking for a good way to help your kids increase their verbal SAT scores without taking the test for them, you may want to start visiting the **Cool Word of the Day** site (http://www.dsu.edu/projects/word_of_day/word.html). As the name implies, the site provides one *Webster's Dictionary*-defined word per day, with hypertext links to interesting and related sites. Additionally, the site offers young wordsmiths a hypertext thesaurus.

Finally, teenagers who want to express their creativity in art, music, and prose, as well as their concerns about the world around them, should check out the **Cyborteens** site (<http://www.milake.com/cyborteens>). Highlights include a host of spellbinding, Shockwave-based animation projects produced by young artists and *Zeen Magazine*, which affords talented writers a place for their words to live in cyberspace.—Angela Hickman



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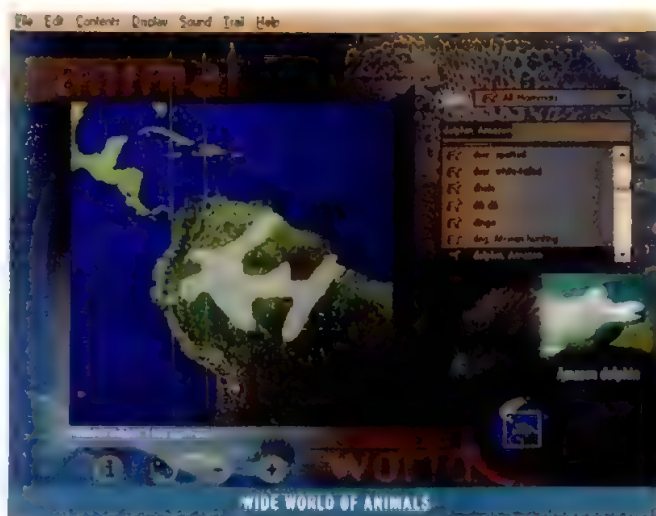
The seventh release of Microsoft's must-have reference library, **Microsoft Bookshelf 1996-97 Edition**, offers a slew of new features, including two additional works for your collection: Internet Directory 96 and The Concise Encarta 96 World Atlas.

The basics (including The American Heritage Dictionary, The Original Roget's Thesaurus, and a life-saving ZIP code guide) are all still here. Other new features include a year-in-review section, 200 new images, 5 hours of audio, more than 100 video clips, and 200 national anthems.

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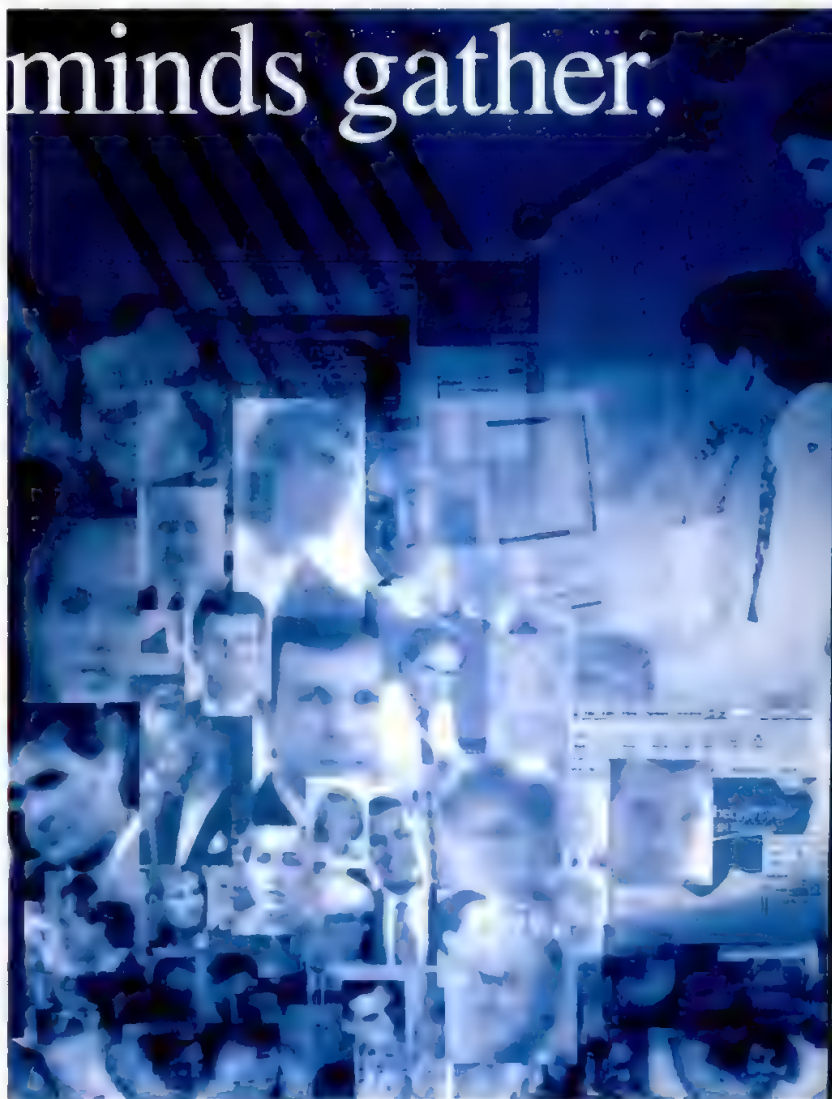
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The World Wide Web and You

Build Your Own Web Site If you always wanted to build your own Web site but didn't quite know how, look no further: We provide a step-by-step guide, along with a look at various methods—and what they entail—to help you decide which path to take toward Web page creation. In addition, we show how three online services help you produce personal Web sites; we also present the types of art and images that work best on the Web.

HTML Authoring Tools

Whether you're a Webmaster, a Web designer, or just someone who wants a good-looking home page, you need solid tools for creating pages in HTML, the standard language of the Web. Our evaluation rates 16 popular tools that run the gamut from tag-oriented code editors to visual WYSIWYG tools, even add-ons for popular word processors. Our tests cover everything from basic page creation to building complex designs to site diagnostics and management.

Data Across the Web

How do you build a data-driven Web application? Companies see the huge potential for Internet and intranet database applications, but they're wrestling with a technology in its infancy. We look at the first generation of tools combining traditional client/server features with new elements that address both the Internet's potential and its problems. Our tests cover client creation; client-side enhancements through plug-ins, Java, or ActiveX; connections between the HTTP server and the database; middleware; and application partitioning.

Web Servers Inside and Out

Web servers lie at the heart of the World Wide Web; they're the software that pumps the data through the Internet's veins. And they're not just for World Wide Web sites anymore: Using the simple, low-cost tools of the Web, intranets are becoming more popular for sharing information within a company. Which server is right for your organization? We test 12 Web servers for Intel, Macintosh, and Unix platforms, including Microsoft Internet Information Server and Netscape's FastTrack and Enterprise servers.

Microsoft SQL Server

The latest release of Microsoft SQL Server brings significant new features to the company's already impressive enterprise database offering. PC Tech looks at its installation, administration, and tuning—and also tests its performance in load, index, query, and multiuser transaction-processing scenarios.

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541	Reading Blaster Jr.	Davidson & Associates Inc.	486
429	RealAudio Version 2.0	Progressive Networks	51
495	Remote Services Management	Software Corp. of America	236
492	Remotely Possible/32	Avalan Technology Inc.	261
951	RLN Access Server 4.1	Attachmate Corp.	NE6
526	Samsung SENS 810 (P-100), 810 (P-133)	Samsung Electronics America	189
544	Scholastic's Magic Schoolbus Explores Inside the Earth	Microsoft Corp.	486
537	School Zone's Alphabet Express	School Zone Publishing Co.	482
411	SciWords	INSO Corp.	75
540	Sesame Street Get Set to Learn!	Creative Wonders	483
402	Seven Habits Tools	Covey Leadership Center	66
422	Sharp F-2700M	Sharp Electronics Corp.	76
473	Sharp XG-E650UB Mark II	Sharp Electronics Corp.	212
549	SkyTrip America	Discovery Channel Multimedia	490
433	Smart Bookmarks 2.0	FirstFloor	44
445	SmartPad 3.5	Softbox Inc.	274
547	Snootz Math Trek	Theatrix Interactive Inc.	486
478	Sony PRD-250WN Discman	Sony Electronics Inc.	213
419	StatView for Windows	Abacus Concepts Inc.	80
550	Strategy Games of the World	Edmark Corp.	491
994	Student Writing and Research Center	The Learning Company	501
995	StudyWorks for Math, StudyWorks for Science	MathSoft Inc.	501
533	SwapCrypt	SCM Microsystems	202
550	Thinkin' Things Collection 3	Edmark Corp.	490
451	3Com EtherLink III LAN+Modem PC Card	3Com Inc.	198
534	3D Body Adventure	Knowledge Adventure Inc.	494
527	TI Extensa 515, TI Extensa 570CDT	Texas Instruments Inc.	190
496	Timbuktu Pro for Networks	Farallon Computing Inc.	250
410	Time & Chaos Professional 5.1.5	ISBister International Inc.	75
440	Toshiba Portégé 650CT	Toshiba America Information Systems Inc.	39
528	Toshiba Satellite Pro 420CDT, Tecra 720CDT	Toshiba America Information Systems Inc.	190
464	Toshiba ZV Capture Card	Toshiba America Consumer Products Inc.	200
463	Trimble PC Card 110	Trimble Navigation Ltd.	202
529	Twinhead Slimnote 8100TX, 8120TV, 875CX	Twinhead Corp.	192
536	Type to Learn	SunBurst Communications	494
997	Typing Instructor Deluxe CD	Individual Software Inc.	501
427	U.A. Corporate Accounting, Version 4.0	Advanced Software Development Corp.	76
530	Unisys Aqunta MN	Unisys Personal Computer Division	192
471	Viewpoint 100	Lightware Inc.	212
458	Viper 8340PA	Integral Peripherals Inc.	202
446	Virtual Desk 2.0	SmartDesk Inc.	277
421	Virtus 3-D Website Builder	Virtus Corp.	80
497	WanderLink	Funk Software Inc.	250
434	WebEx	Traveling Software	44
435	WebWhacker 2.0	ForeFront Group	44
540	Wide World of Animals	Creative Wonders	501
447	Winbatch 968; Winbatch+Compiler	Wilson WindowWare Inc.	277
531	WinBook FX, XP5 P100, XP5 P120	WinBook Corp.	195
493	WinFrame/Access	Citrix Systems Inc.	225
998	Word Smart	The Princeton Review	501
452	Xircrom CreditCard EtherNet + Modem 28.8	Xircrom Inc.	199
541	Your Personal Trainer for the GRE	Davidson & Associates Inc.	501
401	ZIP Express	Insight Software Solutions Inc.	60
548	Zurk's Rainforest Lab	Soleil Software	486

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Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

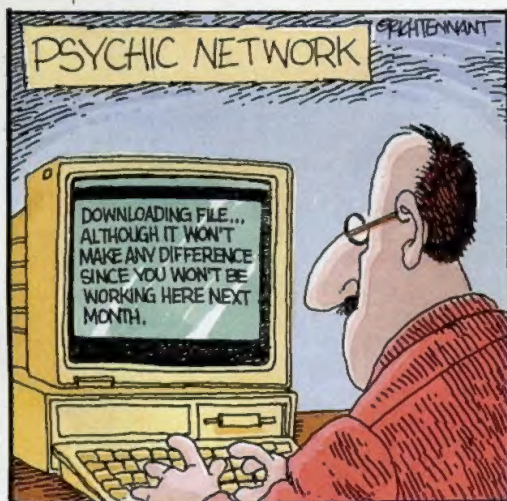
By Don Willmott

Religious Revisionism

Faithful reader Dimitri Saad reports that while his wife was using Microsoft Word for Windows 6.0 to work on a church bulletin, she typed "May our Lord, Jesus Christ, through the grace and bounties of His love towards mankind, forgive thee" only to have Word's grammar checker tell her that "the word 'Christ' does not agree with 'forgive.'"



See, the idea was to buy the CD so you wouldn't need the book. (Britannica ad.)



RICHARD TENNANT

If your entry is used, we'll send you \$50 and a *PC Magazine* T-shirt. Send your entries to Abort, Retry, Fail?, *PC Magazine*, One Park Ave., New York, NY 10016-5802 or via e-mail (text items only) to don_willmott@zd.com. Winners this issue: Brian Anderson, H.R. Downs, David Grossman, Ronald Krall, Dimitri Saad, and Randy Tyndall.

Y'All Lookin' for Work?

Georgia will probably experience a boom after the Olympics. The help-Wanted ads are already heating up: "Large Atlanta law firm has an immediate opening for a professional and creative computer graphics designer-Experience in PageMaker, Corel Draw!, or similar graphics software required."—*THE ATLANTA JOURNAL-CONSTITUTION*

Dictate-MCA Lets Users Create Documents By Typing

Stop the presses! An amazing technology breakthrough! (*InfoWorld*.)

Ads We Sorta Kinda Didn't Understand Dept.

"New high-tech restaurant serves nourishment over the Web. Once you purchase our secret food code, we will transmit soup, grains, and sandwiches via modem. Simply punch in the code, carefully cover the receiving screen with your stretched mouth, relax, and enjoy your dinner. (Be careful to hit the 'pause' button between courses to avoid indigestion.)"—*THE KENNETT PAPER*

BONUS TWO

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Dell's featured computer artist is Diane Fenster of Pacifica, CA.

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